



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
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SR-6J

August 6, 2010

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**Subject: Comments on the Remedial Investigation, Ecological Risk Assessment and
Human Health Risk Assessment Reports – Matthiessen and Hegeler Zinc
Company Site – LaSalle, Illinois**

Dear Ms. Weeks and Ms. Knoepfle,

Attached you will find comments from the reviewers (U.S. EPA, Illinois EPA and SulTRAC on various portions of the reports) on the above referenced document. This is the majority of the comments, however an additional submittal will be provided documenting the U.S. EPA ecological risk assessor's comments sometime in the next week.

If you have any questions or comments, please feel free to contact me.

Sincerely,

Demaree Collier
Remedial Project Manager

cc: R. Berggreen – Geosyntec
 R. Lange – Illinois EPA

**REVIEW OF REMEDIAL INVESTION, ECOLOGICAL RISK ASSESSMENT AND HUMAN
HEALTH RISK ASSESSMENT REPORTS
MATTHIESSEN AND HEGELER ZINC COMPANY SITE
LASALLE, LASALLE COUNTY, ILLINOIS**

August 6, 2010

RI REPORT COMMENTS

GENERAL COMMENTS ON TEXT

1. In the electronic version of the RI report, section numbers should be hyperlinked at least to the chapter level to allow easy navigation within the report for reviewers and readers. Hyperlinking section numbers to the table of contents also would be helpful.

The Table of Contents will be hyperlinked to all of the sections and subsections of the text to facilitate navigating the document.

2. The RI report table of contents should be revised to include Appendix RA, which presents the human health risk assessment (HHRA) and the ecological risk assessment (ERA) for the Matthiessen and Hegeler Zinc Company Site.

This Appendix has been added to the TOC.

3. The final hard-copy version of the RI report should be organized in a more logical order – with all of the appropriate text, figures and tables tabbed together to allow the reader to more easily look through the document for corresponding attachments.

The final RI will have cover sheets and a TOC for each volume to provide for more ease in locating documents in each of the volumes. Tabs will be added to the volumes to facilitate locating subsections within the Figures and Tables volumes. Based on discussions with EPA, we propose to keep the order of the report the same as the original version, with all of the text in one volume, all of the figures in one volume, and the tables and Appendices in subsequent volumes. The tables for sections 1-3 and 5-9 are in Volume 3. Because of the large number of tables in Section 4 of the RI, the Section 4 tables have been separated from the remaining tables and are in Volumes 4 through 6. .

4. At the Matthiessen and Hegeler Zinc Company Site, the term “bedrock” is defined as Pennsylvanian-aged rock, which includes both shale and limestone. When the term “shale” is used in the text and tables of the RI report, the text and tables should clarify if the term “shale” refers to “bedrock” or

otherwise. For example, in Table 2.1.2-1, Table 3.2.3-2, and Appendix G-3-1, the “Geology” columns list both “shale” and “bedrock.” The lithology should be listed generally as simply “bedrock” or should be listed specifically as “shale bedrock,” “limestone bedrock,” or “shale and limestone bedrock” to eliminate confusion about the lithology type.

Agreed. The report will be revised as needed.

5. Throughout the OU1 portions of the RI report, water-bearing zone (WBZ)1 and WBZ2 either are not clearly defined or are defined differently than WBZ1 and WBZ2 for Operable Unit 2 (OU2). This discrepancy is specifically discussed in the review comments on Sections 3, 4, and 6 of the RI report. This discrepancy should be resolved, especially in discussions of site-wide hydrogeology.

Agreed. The report will be revised as needed.

6. The term “Site” or “site”, when referring to the Matthiessen and Hegeler Zinc Company Site should be consistently used throughout the RI report.

The comment is acknowledged; however, the word "site" (capitalized or not) is used hundreds of times in the text and achieving perfect consistency in its use and capitalization would require significant review by high-level staff who understand the subtle differences in usage. A review of the report will attempt to standardize this capitalization, and the report will be revised as needed. However, this aspect of the report will not, in our opinion, limit the ability of the reader to understand the report, and the cost and benefit of making this change will be considered in the performance of this editorial review.

7. Throughout the RI report, the text, tables, and figures use inconsistent terminology. For example, terms are (1) inconsistent (such as “Slag Pile Area” and “Slag Pile”) and (2) inconsistently capitalized (such as “Slag Pile” and “slag pile”). The text, tables, and figures should be revised as needed to present exactly consistent terminology throughout the RI report. It should be noted that the Slag Pile example noted in this comment is only one of the numerous inconsistencies contained in the RI report.

The comment is acknowledged; however, we note that the terms Slag Pile and Slag Pile Area refer to different things and are not inherently inconsistent. As with the preceding comment, achieving perfect consistency in the usage of all terms would require significant commitment of high level staff who understand the differences in terminology. A review of the report will attempt to standardize this capitalization, and the report will be revised as needed. However, this aspect of the report will not, in

our opinion, limit the ability of the reader to understand the report, and the cost and benefit of making these changes will be considered in the performance of this editorial review.

8. Throughout the document relating the topic of soil data, there are reoccurring discussions of Industrial Regional Screening Levels (IRSL), Regional Screening Levels (RSL) and Residential Regional Screening Levels (RRSL). Each of these sets of guidance soil concentrations should be presented in tables and referenced in the text.

The various RSLs are included in all of the tables. However, an additional table listing the various RSLs for the COIs will be provided. The RI directly used the RSL tables for this purpose.

GENERAL COMMENTS ON TABLES

1. Table notes for all OU2 tables were not included in the electronic or hard-copy versions of the RI report. Table notes for all tables should be included in the final RI report.

SulTRAC will provide PDFs of their tables for direct insertion. The table notes will be included as per the submittal from SulTRAC.

GENERAL COMMENTS ON FIGURES

1. OU1, OU2, and the Little Vermilion River (LVR) should be labeled on all figures as appropriate.

A figure is provided, Figure 1.2.1-1, that identifies OU1 (including the Plant Area, the Slag Pile Area and the Little Vermilion River), and OU2. This change will be made as appropriate on other figures.

2. The RI report figures show a north-south oriented line between the Plant Area and Slag Pile. It is not clear what this line stands for. If the line is intended to show the three different components of OU1 (the Plant Area, LVR, and Slag Pile), the line should be added to the figure legends accordingly. The current legends show that the red boundary lines indicate “OU Boundaries.”

The line is intended to delineate portions of the Site from each other, such as the Plant Area, the Slag Pile Area, and the Little Vermilion River, and OU1 from OU2. The line is similar to the lines on the SulTRAC figures labeled Site Boundaries which distinguish the LVR from OU1 and OU2, and distinguish OU1 from OU2. We will change the legend to indicate Investigation Areas, and label the Investigation Areas on the figures.

3. For figures measuring 11- by 17-inches, the scale should be adjusted as needed to allow easy reading. For example, Figures 2.1.3-2 and 2.1.3-1 are very difficult to read and should be rescaled. Insets can be used to address this problem, or the figures can be divided to show north and south areas of sampling (for example, Figure 2.1.3-2 can be divided into Figures 2.1.3-2a and b).

The comment is acknowledged. Certain of the figures have labels that are too small to be easily read. As necessary, these labels will be resized to make them legible. It is not proposed to change the scale of the figures. Consistency in the scale is preferred to minimize confusion in interpreting the figures.

4. Overall, capitalization of the figure titles and of the titles listed in the list of Figures in the table of contents is inconsistent. In some titles, every word is capitalized, but in other titles, only the first word is capitalized. The figure titles and the titles listed in the list of Figures should be consistently capitalized.

The comment is acknowledged. The titles of figures will be revised such that the significant words are capitalized. The capitalization will be revised in the TOC to be consistent with the title block of each figure. For the SulTRAC figures which have all the words all in capitals, the TOC will capitalize each significant word.

5. In the figure title blocks and the list of Figures in the table of contents, the phrases “sample locations” and “sampling locations” both are used. The titles should be revised to use “sampling locations” only because “sample locations” can refer to the actual location of a sample (such as a cooler or a laboratory).

The use of “sample locations” and “sampling locations” in the figure titles will be revised to consistently use the term “Sampling Locations”.

6. The date shown in the title blocks of the figures should reflect the date of submission for the RI report.

The comment is acknowledged. The dates shown on the title blocks of the figures will be consistent and reflect the date of the report submission. The date to be used will be October 2010 (month and year only) which was agreed to with SulTRAC.

GENERAL COMMENTS ON APPENDICES

1. Appendix G-2-1, which provides the OU1 boring logs, was incomplete. For example, the boring logs for MW-1, MW-2, MW-306, etc., were not provided. All boring logs should be included.

Comment is acknowledged. We will attempt to include all OU1 boring logs in the Appendix. Some of the boring logs are from the early 1990's and may not be retrievable. If not, we will include a notation of that fact in the Appendix.

2. Appendix G-2-2, which provides the OU1 construction logs, was incomplete. For example, the monitoring well construction logs for MW-1 and MW-2 were not provided. All construction logs should be included.

Comment is acknowledged. We will attempt to include all OU1 well construction logs in the Appendix. Some of the construction logs are from the early 1990's and may not be retrievable. If not, we will include a notation of that fact in the Appendix.

SECTION 1.0 SPECIFIC COMMENTS

1. **Section 1.2.1.1, OU1 Description, Paragraph 1, Page 1-3.** The text states that Carus “mostly” owns the Slag Pile. The text should be revised to clarify if the Slag Pile has other known or unknown owners. Also, the text states that “within the LVR there are 10.5 acres present with slag.” It is not clear if the text should be revised to read “within the Slag Pile Area, there are 10.5 acres present with slag.” This issue should be addressed as needed.

Identifying the legal owners of the property underlying the entire Slag Pile is not key to achieving the objective of the RI and was not investigated by Geosyntec. We understand that ownership of the property underlying the Slag Pile north of the fence line has changed over time, including recently, and we are not aware of who is the current owner(s). The text will be revised to clarify that Carus owns the property south of the fence line, but we do not propose to attempt to identify the owner(s) of the property north of the fence line. The text will also be clarified to describe the apparent areal extent of slag within the LVR.

2. **Figure 1.2.1-1, Site Location Map.** The Site Location Map should include the formal Site name (Matthiessen and Hegeler Zinc Company Site) as well as the respective specific areas of OU2 that are called out in the text. Currently, the figure shows only OU1-specific components. For example, the OU2 Rolling Mill, residential area, quarry, and farmland are not shown but should be.

Comment acknowledged. The formal Site name will be added. The information to be included on the map for OU2 will be obtained from SulTRAC and added to the figure.

SECTION 2.0 GENERAL COMMENTS

1. To better understand the RI activities at the Matthiessen and Hegeler Zinc Company Site, tables of the following should be included for OU1 because the accompanying data or information all are described to some degree in the Section 2 OU1 text:

- Phase I and Phase II sample information should be included for all matrices and include the following:
 - Logistical information (sampling date, depths, matrix, locations, identification [ID] numbers, etc.)
 - Analytical information (types of analyses conducted on collected samples)
- Air sampling data
- Monitoring well installation details for pre-2007 monitoring wells, Phase I monitoring wells, and Phase II monitoring wells, including which wells were in disrepair, repaired, or abandoned, and citations of appropriate information from Appendix G-2-2
- Monitoring well water quality summary

The comment is acknowledged. It is understood that some of the requested information was included in the OU2 portion of the RI Report. Logistical information for OU1 wells and borings (sampling date, depth, matrix, numbers, etc.) will be provided in a table. A summary table showing the analyses for each sample will be provided. Air sampling/monitoring data will be added. Monitoring well installation details for pre-2007 wells will be added to the extent those data are available, as indicated under General Comments on appendices, above. Monitoring well development/purging/stabilization data will be provided.

2. All Section 2 figures should be coded to show which locations were sampled during Phase I and which were sampled during Phase II. Additionally, some figures are not specifically cited in their corresponding sections. For example, Sections 2.1.1 and 2.1.1.2 should be revised to refer to Figures 2.1.1-1 and 2.1.1-2. All text in Section 2 should be revised as needed to refer to figures that show sampling locations.

The comment is acknowledged. We will add a note to the figures referencing the phase of the work relative to the sample numbers, to allow the reader to interpret which samples were from what

sampling round. Where figures are not cited at all or are not correctly cited in their corresponding sections, the changes will be made to the text.

3. No discreet soil sampling was conducted of the 0 to 6” soil profile. The absence of this data represents a data gap and precludes appropriate Risk Assessment activity. This should clearly be identified as a data gap and detail what further actions will be taken to address this at the Site.

The comment is acknowledged; however, we do not believe the lack of this soil data precludes appropriate risk assessment or will materially affect the identification of response action objectives or other FS activities. The Data Gap and Uncertainties list will be revised to include reference to the lack of discreet soil sampling for the 0 to 6 inches depth. However, the RI scope of work was conducted in accordance with the EPA-approved Work Plan, and it would be impossible to complete additional sampling and incorporate those results prior to the required completion date of the RI and FS Reports.

SECTION 2.0 SPECIFIC COMMENTS

1. **Section 2.1, OU1 Investigation Activities, Page 2-1, Paragraph 2.** The text should be revised to cite EPA-approved sampling and analysis-type plans submitted on behalf of Carus Corporation and Carus Chemical Company.

The text will be revised to refer to the EPA-approved Work Plan and other planning documents.

2. **Section 2.1, OU1 Investigation Activities, Page 2-1, Paragraph 3, and Page 2-2, Paragraph 3.** Currently, the text refers to both “numbers of samples” and “numbers of sampling locations.” These terms are unclear. Instead, the text and figures should consistently refer to either “number of samples collected,” “number of locations sampled,” or both as applicable.

The text seems clear as written. No change is proposed in response to this comment.

3. **Section 2.1.1, Soil Investigation, Page 2-2, Paragraph 2.** The text refers to “Figure 2.1.1-X through 2.1.1-X” and “Table 2.1.1-X.” The “X” in these figure and table numbers should be replaced with the correct numbers. Additionally, Section 2.1.1 has only one table, Table 2.1.2-1, which details monitoring well construction. However, the text states, “Table 2.1.1-X summarizes information for the samples collected...” This text indicates that a table should be included that summarizes

sampling information for all samples collected. All tables should be included as applicable, and the text should be revised as needed to correctly refer to the tables.

The comment is acknowledged. An additional figure will be added to address the Plant Area. A table will be added to summarize the information on the samples collected. Also the table and figure numbers will be corrected.

4. **Section 2.1.1.1, Phase I Soil Investigation (OU1), Page 2-3, Paragraph 3.** The text should be revised to refer to Appendix G-2-1, which contains the OU1 boring logs.

The text will be revised to refer to the correct Appendix.

5. **Section 2.1.1, Phase I Soil Investigation (OU1), Sentence 1, Page 2-4, Paragraph 2.** A data table should be created showing the described Slag Pile depths, thicknesses, and volume as well as the underlying natural geology and cover extent. This table could be presented either in Section 2 or Section 3 of the RI report. Currently, neither section contains such a table.

It is not clear that this table is required to allow the reader to understand the report, given that the requested information is not tabular in nature, i.e., there are not multiple data points with the information. The information for the Slag Pile as a whole is in the report, and adding another table will not significantly advance the objectives of the RI. The text will be revised to refer to a cross section to illustrate the depths, thicknesses and geology underlying the Slag Pile.

6. **Section 2.1.1, Phase I Soil Investigation, Sentence 2, Page 2-4, Paragraph 2, and Figure 2.1.1-1.** The text lists only three locations (SB-301, SB-303, and SB-305) for slag sampling during Phase I. However, Section 2.1, “OU1 Investigation Activities,” Page 2-1, Paragraph 3, states that solid matrix samples were collected from 10 locations in the Slag Pile Area during Phase I. The text in Sections 2.1.1 and 2.1 should be rewritten as needed to clarify and resolve this apparent discrepancy, and Figure 2.1.1-1 should be revised to indicate Phase I and Phase II color coding consistent with the revised text.

The referenced sentence states that these three wells penetrated through the slag and underlying alluvium and into the bedrock. It did not indicate these were the only locations for slag sampling during Phase I. The subsequent two sentences refer to thirty-one trenches excavated to delineate the extent of the Slag Pile Area. The figure will be revised to include further investigations of the Slag Pile, (trenching) per comment 7, below. No changes are proposed to the figures regarding the Phase I and Phase II color coding.

7. **Section 2.1.1, Phase I Soil Investigation, Page 2-4, Paragraph 2, and Figure 2.1.1-1.** The text states that 31 trenches were excavated to evaluate the lateral boundaries of the Slag Pile Area. Figure 2.1.1-1 should be revised to show the locations of these 31 trenches.

The comment is acknowledged and agreed. The trenches will be added to the figure.

8. **Section 2.1.2, Groundwater Investigation, Page 2-5, Paragraph 1, Bullet 2.** The text indicates that background conditions correspond to “bedrock” groundwater conditions. However, background conditions in Quaternary-aged unconsolidated sediments would not correspond to “bedrock” conditions. “Bedrock” is also referred to as Pennsylvanian-aged shales and limestone in this region. Therefore, there are likely two background conditions: “bedrock” conditions and the overlying native Quaternary-aged unconsolidated sediments. The text should be revised as needed to clarify this issue.

The comment is acknowledged and agreed. The text will be revised to clarify this issue.

9. **Section 2.1.2.2, Phase II Groundwater Investigation (OU1), Page 2-8, Paragraphs 2 and 3, and Appendix G-3-1.** In addition to groundwater samples collected from the wells discussed, it is assumed that water levels also were measured in the two temporary monitoring wells (ISW-001 and ISW-002) during June and August 2009. Paragraph 2 indicates that elevation measurements of both the interstitial water and the river adjacent to each temporary well were taken. The text should be revised to specifically describe any groundwater elevation measurements taken and should refer to Appendix G-3-1.

Additionally, Appendix G-3-1 presents groundwater levels for temporary monitoring wells ISW-001 and ISW-002 for October 2009 only. Also, Appendix G-3-1 lists locations ISW-001-River and ISW-002-River. The text in Section 2.1.2.2 and the Appendix G-3-1 table should be revised as needed to describe and list specific times that the interstitial groundwater level measurements occurred at ISW-001 and ISW-002 as well as the ISW-001-River and ISW-002-River sampling locations.

Finally, the reviewer assumes that the adjacent ISW-001-River and ISW-002-River sampling locations are for the “river adjacent to each temporary well” as described in Paragraph 2 of Section 2.1.2.2. If this assumption is correct, the text in Appendix G-3-1 should be revised to refer to these sampling locations.

The text and appendix will be revised to refer to the water level measurements taken in June, August, and October 2009 in the two ISW wells and in the LVR adjacent to the wells. The text will be

revised to clarify that the LVR was not sampled adjacent to the wells, only water level measurements were taken.

10. **Section 2.1.2.2, Phase II Groundwater Investigation (OU1), Page 2-9, Paragraph 0, and Appendix W.** The list of Appendixes in the table of contents lists Appendix W, but the RI report does not include such an appendix or a table that lists all the sampled monitoring wells and their stabilization parameters. Additionally, as discussed under the Section 2.0 General Comments, Comment No. 1, Bullet 4, the RI report should include a table summarizing the monitoring well water quality. The RI report should be revised as needed either to include Appendix W or delete Appendix W from the list of Appendixes and to include Appendix W or a table that lists all the sampled monitoring wells and their stabilization parameters.

A table of well stabilization data will be added. Reference to Appendix W will be removed and the table properly cited.

11. **Section 2.1.3.1, Phase I Surface Water and Sediment Investigation (OU1), Page 2-9, Paragraph 1, and Figure 2.1.3-1.** The text indicates that 20 sediment grab samples were collected and that these sampling locations are shown on Figure 2.1.3-1. However, Figure 2.1.3-1 shows 36 “sediment samples” (in the legend), and it is impossible to tell which of these samples were collected during Phase I and which include the 20 grab samples. The figure and text should be revised as needed to address these issues.

The text will be revised to clarify the distribution of the sampling locations. The figure is intended to show all sediment sampling locations, not just Phase I. The figure will be revised to increase the size and improve the legibility of the labels.

12. **Section 2.1.3.1, Phase I Surface Water and Sediment Investigation (OU1), Page 2-10, Paragraph 1, and Figure 2.1.3-2.** This paragraph indicates that an additional 15 sediment samples were collected in the LVR. The text should be revised to indicate that these sediment sampling locations are shown on Figure 2.1.3-2, and the figure should be revised show these locations.

The text will be revised to clarify the sediment sampling locations. The figure will be revised to increase the size and improve the legibility of the labels.

This paragraph also indicates that eight surface water samples were collected in the LVR. The text should be revised to indicate that these sediment sampling locations are shown on Figure 2.1.3-2, and the figure should be revised show these locations. Also, Figure 2.1.3-2 shows only four “surface

water sample locations” (in the legend). Either the text should be revised to clarify how the eight water samples were collected from the four locations shown in the figure or this discrepancy should be resolved.

The text will be revised to note the sampling locations are shown on Figure 2.1.3-2. The figure will be revised to include all of the surface water sampling locations.

Finally, as detailed in the Section 2.0 General Comments, Comment No. 1, Bullet 1, a table should be included to clarify the sediment and surface water sampling that occurred during Phase I.

The comment is acknowledged. However, it is not intended that a distinction be made for those data collected as part of Phase I and Phase II. The absence of this information will not, in our opinion, limit the readers’ understanding of the RI Report. A note will be added to the figures referring to the boring number relative to a phase number.

13. **Section 2.1.3.1, Phase I Surface Water and Sediment Investigation (OU1), Page 2-10, Paragraph 2.** The text refers to “Table X” and should be revised to refer to the correct table number.

The appropriate table, which was omitted from the draft RI Report, will be included from the Work Plan and Field Sampling Plan.

14. **Section 2.1.3.1, Phase I Surface Water and Sediment Investigation (OU1), Page 2-10, Paragraph 6.** The text refers to three staff gauges. These staff gauge locations should be presented on a figure, and the figure should be cited in the text.

The LVR water level measuring points will be added to Figure 2.1.3-2, and the figure referenced in the text.

15. **Section 2.1.3-2, Phase II Surface Water and Sediment Investigation (OU1), Page 2-12, Paragraph 3, and Figure 2.1.3-1.** The text states that a total of 19 sediment samples were collected in the LVR as shown on Figure 2.1.3-1. However, Figure 2.1.3-1 shows nine sediment samples (indicated by a star in the legend). The figure and the text should be revised as needed to resolve this discrepancy.

The comment is acknowledged. However, the sample locations and number of samples are described in the following paragraphs. No change is proposed in response to this comment.

16. **Section 2.1.3-2, Phase II Surface Water and Sediment Investigation (OU1), Page 2-12,**

Paragraph 4, and Figure 2.1.3-2. The text states that a total of 27 surface water samples were collected from nine locations. However, Figure 2.1.3-2, which purportedly shows all LVR surface water locations, shows only four surface water samples. The figure and the text should be revised as needed to resolve this discrepancy.

The sampling points will be added to the figure and the text revised to clarify the locations of the sampling points.

17. **Section 2.1.4 & 2.2.7 Ecological Receptor Investigations.** No attempt is apparent to perform seasonal evaluation and species identification during the RI. All work reported appears to have been performed only in the late summer and/or the fall of 2007. It appears from the text that habitat characterization efforts and terrestrial and avian species surveys were conducted in all day roaming. Quiet fixed station early morning and late evening observations in representative habitat locations is a more appropriate technique. Illinois EPA also requests that fauna species identified should be presented in a tabular format referenced in the text and listing the scientific name, common name, and number of observations.

We will provide the requested tables for OU1 and OU2. Habitat characterizations were completed in accordance with the approved work plans. Further, it is believed that the characterization conducted identified representative habitat, species and fauna.

Supplemental Response: While the work conducted did not include seasonal evaluations or quiet fixed station observations, the combination of on-site reconnaissance and review of available literature sufficiently characterized the available habitat and associated potential ecological receptors for OU1 and OU2. Conduct of the additional evaluations suggested would not materially change the outcome of the SLERA.

18. **Section 2.1.4-1, Phase I Ecological Characterization, Page 2-13, Paragraph 1.** It may be worthwhile to revise the text to note that the Phase I OU1 and OU2 ecological receptor investigations occurred on the same day(s).

The text will be revised to include this note.

19. **Section 2.1.4-1, Phase I Ecological Characterization, Page 2-14, Paragraph 2.** The text describes observed habitat types, water features, etc. The RI report should include a figure, reference (in an

appendix), or a habitat evaluation report (if there is one) that contains figures showing the features described in text.

The comment is acknowledged. The requested information is included in the RA Appendix. The text will be revised to cross reference the information in the RA Appendix.

20. **Section 2.1.4-1, Phase I Ecological Characterization, Page 2-15, Paragraph 1.** The text refers to Figure G3-1, which is not included. This discrepancy should be resolved.

The text has been revised to correct the reference. The proper figure number is Figure 2.1.4-1.

21. **Section 2.1.4-2, Phase II Ecological Characterization, Page 2-19, Paragraph 0, Bullets 1 through 4.** The RI report should include a figure, a reference to a report (if there is one), the community assessment, and a discussion of the sampled LVR reaches to accompany the text. In addition, the text should be revised as needed to discuss these items.

The comment is acknowledged. The requested information is included in the RA Appendix. The text will be revised to cross reference the information in the RA Appendix.

22. **Figure 2.3-1, Site-Wide Background Soil Sampling Locations.** The figure should be revised to outline each park area for clarity.

The figure will be revised as requested. The park outline information will be obtained from SulTRAC.

SECTION 3.0 GENERAL COMMENTS

1. The text in Section 3 refers to the Slag Pile several times as the “6-acre slag pile.” However, in previous sections, it is described as occupying 10.5 acres. This discrepancy should be resolved.

The use of the phrase "6-acre slag pile" was a holdover from previous reports that had identified that acreage. The text will be revised to describe the Slag Pile as 10.5 acres.

2. The text in Section 3.2 discusses monitoring wells and should be revised to clarify that OU1 monitoring wells are being discussed and not OU2 wells because some figures (such as Figures 3.2.3-3 and 3.2.3-4) also show OU2 monitoring wells and data.

The text will be revised to clarify the wells being described.

3. Sections 3.2.3.3 and 3.2.3.4 contain text indicating that there are not two WBZs but one consistent WBZ. These statements directly conflict with the OU1 presentation of the data (for WBZ1 and WBZ2), the OU2 interpretation of groundwater using the same WBZ1 and WBZ2 definitions and data presentations, and the discussion in Section 3.4, the site-wide interpretation. This issue must be resolved for the OU1 text and with the OU2 interpretation. If necessary, a revised site-wide interpretation of groundwater may be needed. The groundwater interpretation must be consistent across the entire Matthiessen and Hegeler Zinc Company Site.

The text will be revised to refer to the WBZs earlier and to make the description consistent with the site-wide model.

SECTION 3.0 SPECIFIC COMMENTS

1. **Section 3.1.3, Surface Water Hydrology, Page 3-5.** This section discusses surface water hydrology and seems to include only the general regional hydrology and anthropogenic-influenced surface water at OU1. The text should be revised to also discuss surface water at OU2. Additionally, the text should describe any wetlands, intermittent streams, ponds, seeps, etc., at the Matthiessen and Hegeler Zinc Company Site as well as their interconnectedness and relation to the LVR.

Text will be added to describe the surface water on OU2 and the seep area between OU1 and OU2.

2. **Section 3.1.7, Regional Hydrogeology, Page 3-8, Paragraph 2.** The text should be revised to discuss how many of the 82 wells within the 2-mile-radius of the Site are private use wells, how many are public supply wells, the directions of the wells from the Site, and the current status of the wells if known. The addition of a figure to clarify these issues should be considered.

Information will be researched on the vicinity wells. To the extent possible from the reasonably available data, the distinction between public and private water supply wells will be made. The distance and direction to the public water supply wells will be provided, if that information is available.

3. **Section 3.2.1, Soils, Page 3-10, Paragraph 1.** Figure 3.2.1-1 shows Appleriver silt loam (732A and 732B) and DuPage silt loam (3321A) as OU1 soils, but these soils are not described in the text. The text should be revised to discuss these soils.

The text will be revised to include this information.

4. **Section 3.2.3, Hydrogeology.** The text in Section 3.2.3 does not define WBZ1 or WBZ2, which are first discussed in Section 3.2.3.2, Variations in Water Levels. The text in Section 3.2.3 should be revised to define WBZ1 and WBZ2.

The text will be revised to describe the two WBZs.

5. **Section 3.2.3.1, Hydrogeologic Characteristics, Paragraph 6.** The text in this paragraph first refers to Table 3.2.3-1, Summary of Hydraulic and Conductivity Testing for OU1 Wells. However, the previous five paragraphs all discuss the specific values presented in Table 3.2.3.1. Therefore, Table 3.2.3-1 should be introduced sooner in Section 3.2.3.1. Additionally, Table 3.2.3-1 should be revised to include the lithology of the WBZ so that the hydraulic conductivity and lithology can be compared.

The text will be revised. The table will be revised to include reference to the lithology in which the well is completed and the WBZ intercepted by the well.

6. **Section 3.2.3.2, Variations in Water Levels, Page 3-16, Paragraph 1.** The text discusses water level variations in OU1 monitoring wells. It would be very helpful to include a table that (1) shows which monitoring wells are located in which WBZ and (2) includes the wells' screened geology.

Table 3.2.3-2 includes the lithology and WBZ for each well. No change is proposed in response to this comment.

7. **Section 3.2.3.3, Groundwater Gradients, Recharge, and Discharge, Page 3-18, Paragraph 0.** The text states that "the water levels in the glacial wells are consistent with the water levels in the Pennsylvanian, suggesting these are a single consistent WBZ." As noted in Section 3.0 General Comments, Comment No. 3, this statement contradicts previous text and figures indicating that WBZ1 and WBZ2 are separate. This discrepancy should be resolved.

The text has been revised to resolve this discrepancy. The two WBZs are described as separate.

8. **Section 3.2.4, Summary of Hydrogeologic Conditions, Page 3-19, Paragraph 1.** As noted in Section 3.0 General Comments, Comment No. 3, the text in this section contradicts previous text and figures indicating that WBZ1 and WBZ2 are separate. This discrepancy should be resolved.

The text has been revised to resolve this discrepancy. The two WBZs are described as separate.

9. **Section 3.4.3, Site-wide Hydrogeology, Page 3-35, Paragraph 1, and Figures 3.4.3-1 and 3.4.3-2.** Figures 3.4.3-1 and 3.4.3-2, the site-wide potentiometric maps, were not included with the hard-copy or electronic versions of the RI report. These figures should be included in the final RI report.

The missing figures will be provided in the corrected Final RI Report.

10. **Section 3.4.3.1, Hydraulic Conductivity, Page 3-36, Paragraph 0.** The text states that the site-wide WBZ1 wells have a “wide range” of hydraulic conductivity values. However, it is inaccurate to state that the hydraulic conductivity values have a “wide range.” Site-wide, most of the hydraulic conductivity values and all of the OU2 values range from 10^{-2} to 10^{-4} , which indicates sandy silts to silty clays. Only one well, MW-1 at OU1, has a conductivity value of 10^{-1} . (This well is set in slag materials, but it is difficult to determine the lithology because the soil boring and well construction logs seem to be missing from the corresponding appendices.) The text should be revised to state that the WBZ1 hydraulic conductivity values indicate Quaternary-aged unconsolidated materials.

The comment is acknowledged. While most of the hydraulic conductivity values fall in the range of 10^{-2} to 10^{-4} cm/sec, there are wells with hydraulic conductivity values ranging from 2×10^{-1} to 4×10^{-6} cm/sec. This is fairly described as a wide range of hydraulic conductivity values. The range of 10^{-2} to 10^{-4} cm/sec is not limited to sandy silt and silty clay soils but also includes soils described as clean sand and silt. The text is not intended to identify the materials, e.g., Quaternary-aged unconsolidated materials, but rather to characterize the hydraulic conductivities of this WBZ. No change is proposed in response to this comment.

11. **Figures 3.2.3-2 through 3.2.3-5.** These figures show OU1 and OU2 water levels and potentiometric surfaces but should be revised to show only OU1 water levels and potentiometric surfaces discussed in the text. Also, either the figures should show groundwater flow directions or the text should be revised as needed to indicate why groundwater flow directions are not shown in the figures.

The comment is acknowledged. The text only refers to the OU1 portion of the figure because it is in the OU1 section of the report. However, the potentiometric surfaces on the figures were developed by considering and interpreting the data on both OU1 and OU2. It seems incomplete to present the figure with the data from the adjacent OU2 portion of the Site omitted since that data did contribute to the conclusions for OU1. A cross-reference to the report section describing the OU2 data will be included. The figure will be revised to include groundwater flow direction on the OU1 portion of the Site.

SECTION 4.0 GENERAL COMMENTS

1. In Section 4.1, the text does not specify the total number of samples collected and analyzed for each contaminant of interest (COI). The text should be revised to include this information for each medium and investigation area.

Text will be added to refer to tables 4.1.2-1 and 4.1.2-2 (soil), 4.1.3-1 (groundwater), 4.1.4-1 (sediment), and 4.1.4-2 (surface water) which list the analyses performed on each sample.

Additionally, the text in Section 4.1, which discusses the nature and extent of contamination for OU1 groundwater, does not mention WBZ1 or WBZ2 at all. The text should be revised as needed to indicate the COIs for the WBZ1 and WBZ2 groundwater samples.

The text will be revised to refer to the COIs present in the specific WBZs.

Finally, Section 4.1 indicates that no groundwater wells were sampled in the western and northern portions of the Plant Area of OU1. The text should be revised to include a justification for this decision.

Text will be added to explain that the wells in this portion of the Plant Area were not sampled as a result of there being insufficient water in the wells installed in that area to provide an adequate sample for analysis. Additionally, the wells that were not sampled due to insufficient water will be noted on the appropriate figures.

2. Many of the samples discussed in Section 4.1 were collected between 1991 and 1994. Significant changes may have occurred to COIs and the sampled media since then, so these results may not be representative of current conditions. The older data can be included in the RI as historic contamination data. However, these data should not be included in discussions of the current nature and extent of contamination. Specific examples of this issue are discussed further in the Section 4 Specific Comments below.

The comment is acknowledged. The 1991 and 1994 data were obtained by Illinois EPA and Geosyntec in their assessments of the Site. It was discussed and agreed with EPA to include these data inasmuch as IEPA would be reviewing the RI Report and it was considered appropriate to include those data.

The COIs present in the soil, metals primarily, are not typically subject to significant change over time, and these data were included to facilitate as complete a characterization of the site as the available data could provide. It is proposed to continue to include these data. In the introduction to Section 4.0 some text will be added to explain the rationale for considering that data. A note will be added to the text to refer to these historical data. Where groundwater data are included from the historical sampling, those data will be presented on a separate figure, recognizing that groundwater chemistry is more likely to change over time than soil chemistry.

3. The Section 4.1.2 text, tables, and figures indicate sampling depths as “zero ft bgs.” Samples cannot be collected from 0 feet (ft) below ground surface (bgs). The text, tables, and figures should be revised to specify the sampled depth interval (such as 0 to 0.5 or 0 to 0.25 ft bgs).

The comment is acknowledged. The descriptions of sample depth as “zero ft bgs” are from the sample descriptions on the historical samples obtained by the IEPA. There are no other depth indications associated with these sample results. The text will be revised to indicate that the zero ft bgs description is taken directly from the sample log. No changes to these descriptions are proposed.

4. The Section 4 figures frequently show non-detect results. All non-detect results should be removed from the figures so that the detected results are easier to review.

The comment is acknowledged. The text will note that some of the detection limits exceed the screening level. The figures will be revised to remove the non-detection results.

Additionally, the figures contain blue and green symbol colors that are hard to distinguish. These symbol colors should be changed so that the figures are easier to review.

The comment is acknowledged. There was agreement reached in the preparation of the RI Report as to what colors would be used. The available colors and the objective of making benign colors represent less impacted samples and more potent colors represent more impacted samples constrain the selection of colors for use. It is proposed that no change be made in response to this comment.

5. The Section 4.1 figures should be revised to show the applicable screening values for each COI (such as the industrial regional screening level [IRSL], residential regional screening level [RRSL], background threshold value [BTV], maximum contaminant level [MCL], and Tapwater Regional Screening Level [RSL]).

The comment is acknowledged. To the extent possible without overly complicating the figures, changes will be made to the legends of the figures to provide the screening values.

SECTION 4.0 SPECIFIC COMMENTS

1. **Section 4.1.1, OU1 Investigation Areas, Page 4-3, Paragraph 1, and Figures 4.1.1-1 and 4.1.1-2.**

The text states that the investigation areas are shown on Figures 4.1.1-1 and 4.1.1-2. However, the figures do not show these areas. The figures should be revised to show the investigation areas.

The labels on the figures will be edited to identify the OU1 investigation areas.

2. **Section 4.1.2, OU1 Soil Results, Page 4-4, Paragraph 1.** The text states that “RI soil sampling results for OU1 for the Plant, Slag Pile, and LVR sampling areas” are discussed in Section 4.1.2. However, no soil samples were collected from the LVR. The text should be revised as needed to resolve this discrepancy.

The text will be revised to remove reference to soil sampling in the LVR.

3. **Section 4.1.2, OU1 Soil Results, Page 4-5, Paragraph 1, and Figure 4.1.2-1.** The text states that the “brown circles indicate the measured concentrations were above the background threshold values (BTVs) but below the RRSLs for at least one COI.” However, Figure 4.1.2-1 shows that the brown circles indicate arsenic concentrations above the IRSL and below the BTV and the pink circles indicate arsenic concentrations above the IRSL and above the BTV. The text and figure should be revised as needed to resolve this discrepancy.

The text will be revised to clarify that the BTV arsenic concentrations are above the RSLs. No change is proposed to the figure.

4. **Section 4.1.2.1, Plant Area Soil Results, Page 4-6, Paragraph 4, and Table 4.1.2-5.** The text states that “only seven of the Plant Area shallow soil samples had a manganese concentration greater than the BTV.” However, Table 4.1.2-5 shows that sample C-9 contained manganese at a concentration of 1,530 milligrams per kilogram (mg/kg), which exceeds the shallow soil BTV of 1,527 mg/kg. The text and Table 4.1.2-5 should be revised as needed to resolve this discrepancy.

The text and table will be corrected to resolve this discrepancy.

5. **Figure 4.1.2-3, Table 4.1.2-9, and Pages 4-8 and 4-9.** The text boxes on Figure 4.1.2-3, the data in Table 4.1.2-9, and the text on Pages 4-8 and 4-9 are inconsistent. The figure, table, and text should be revised as needed to resolve all discrepancies.

The text, Figure 4.1.2-3, and Table 4.1.2-3 will be revised as needed to be consistent with the data on Table 4.1.2-9.

6. **Table 4.1.2-9 and Figure 4.1.2-3.** Table 4.1.2-9 shows all samples with at least one compound above detection limit. However, sample ID SB-319 is listed on both Table 4.1.2-9 and Figure 4.1.2-3 and the sample has no compounds listed above detection limit. Please either adjust text to state that the sample is included even though all compounds are non-detect or adjust Table 4.1.2-9 and Figure 4.1.2-3 accordingly.

The text will be revised to note that the table also includes compounds that have detection limits above the screening values.

7. **Figure 4.1.2-7, Table 4.1.2-21, and Pages 4-14 through 4-16.** The text boxes on Figure 4.1.2-7, the data in Table 4.1.2-21 and the text on Pages 4-14 and 4-16 are inconsistent. The text states that the data (SVOCs in Slag Pile Area soil) is presented in the text, table, and figure; however the data for each sample is transcribed differently on the table, figure, and text. The figure, table, and text should be revised as needed to resolve all discrepancies.

The text and figure will be revised to be consistent with the data presented on the table.

8. **Section 4.1.2.2, Slag Pile Soil Results, Page 4-14, Paragraph 4, and Table 4.1.2-21.** The text states that three shallow samples (MW-301H, SSI-X103, and SSI-X104) had non-detectable semivolatile organic compound (SVOC) concentrations. However, Table 4.1.2-21 shows that the three samples contained SVOCs at concentrations above the detection limits. The text and table should be revised as needed to resolve this discrepancy.

The text will be revised to resolve this discrepancy.

9. **Section 4.1.3, OU1 Groundwater Results.** The text states that dissolved and total metals OU1 groundwater samples were collected. The text should be revised to explain how and why the dissolved metals groundwater samples were collected.

The text will be revised to refer to the methods detailed in the EPA-approved Work Plan and Field Sampling Plan.

10. **Section 4.1.3, OUI Groundwater Results.** Of the 36 groundwater samples collected from the Plant Area, 25 were collected between 1991 and 1994. Additionally, 3 of the 10 Plant Area locations were sampled between 1991 and 1994 only, and no recent samples have been collected. Of the 27 groundwater samples collected from the Slag Pile, 10 were collected between 1992 and 1994. Additionally, 4 of the 11 Slag Pile locations were sampled between 1992 and 1994 only, and no recent samples have been collected. Groundwater is a flowing medium. As noted in the Section 4.0 General Comments, General Comment No. 2, groundwater results 16 to 19 years old may not be representative of current conditions. These data can be included in the RI report as historic contamination data. However, these data should not be included in discussions of the current nature and extent of contamination. The text should be revised as needed to address this issue and to include a discussion regarding the usability of groundwater data collected from 1991 through 1994.

The comment is acknowledged. The historical data from 1991 through 1994 are from the IEPA and Geosyntec site assessments, and are included in the interest of completeness. It is acknowledged that groundwater is a flowing medium and the historical data may not represent current conditions. Inasmuch as groundwater levels, and the ability to recover samples, have changed over time, some of these samples represent the only available data for select locations on site. Attempts were made between 2007 and 2009 to sample the three Plant Area wells and the four Slag Pile Area wells referenced in the comment. Each of these wells was either damaged and not useable or repeatedly dry in the late 2000's and no samples could be collected. The groundwater data from the historic sampling events will be presented on separate figures. In addition, in response to other comments, we intend to indicate on figures showing the late 2000's sampling that some wells were dry when sampling was attempted. We will also add brief text indicating that the 1990's groundwater data may not reflect current conditions and that its usefulness for different purposes (risk assessment, remedial alternatives analysis, etc.) will need to be addressed on a case-by-case basis.

11. **Table 4.1.3-4 and Figure 4.1.3-3.** The volatile organic compound (VOC) concentrations on Figure 4.1.3-3 are inconsistent with the VOC concentrations listed on Table 4.1.3-4. For example, Figure 4.1.3-3 shows that for MW-A, all compounds were non-detect. However, Table 4.1.3-4 lists dichloromethane at a concentration of 0.26 J microgram per liter (µg/L) at MW-A. The table and figure should be revised as needed to resolve all discrepancies.

The figure will be revised as necessary to resolve this discrepancy.

12. **Table 4.1.3-5 and Figure 4.1.3-4.** The SVOC concentrations on Figure 4.1.3-4 are inconsistent with the SVOC concentrations listed on Table 4.1.3-5. For example, Figure 4.1.3-4 shows that for MW-1, all compounds were non-detect. However, Table 4.1.3-5 lists di-n-butylphthalate at a concentration of 2.0 J µg/L at MW-1. The table and figure should be revised as needed to resolve all discrepancies.

The figure will be revised as necessary to resolve this discrepancy.

13. **Section 4.1.3.2, Slag Pile Groundwater Results, Page 4-22, Paragraph 1.** The text states that “groundwater samples from the Slag Pile Area were not analyzed for pesticides and PCBs.” The text should be revised to explain why these samples were not analyzed for pesticides or polychlorinated biphenyls (PCB).

As noted in Section 2.1, the groundwater analyses were conducted in accordance with the EPA-approved Work Plan and Field Sampling Plan. Pesticides and PCBs were not included as they were not used or disposed in the Slag Pile Area. They were analyzed for in the Plant Area where there was some potential for their use.

14. **Section 4.1.3.2, Slag Pile Groundwater Results, Page 4-24, Paragraph 5.** The text indicates that in January 2008, two groundwater samples were collected from the Slag Pile Area (one from MW-2 and one from MW-322H) and analyzed for VOCs. No other samples from the Slag Pile Area were analyzed for VOCs. Therefore, less than 10 percent of the samples from the Slag Pile Area were analyzed for VOCs. The text should be revised to explain why so few samples from the Slag Pile Area were analyzed for VOCs.

As noted in Section 2.1, the groundwater sampling and analyses were conducted in accordance with the EPA-approved Work Plan and Field Sampling Plan. VOCs were proposed to be analyzed for in a number of wells. However, due to the absence of sufficient water in certain wells to provide for analysis, these analyses were not able to be performed. The text will be modified to indicate that the number of VOC samples was impacted by the absence of sufficient water for sampling in certain wells.

15. **Section 4.1.3.2, Slag Pile Groundwater Results, Page 4-24, Paragraph 6.** The text indicates that in January 2008, two groundwater samples were collected from the Slag Pile Area (one from MW-2 and one from MW-322H) and analyzed for SVOCs. No other samples from the Slag Pile Area were

analyzed for SVOCs. Therefore, less than 10 percent of the samples from the Slag Pile Area were analyzed for SVOCs. The text should be revised to explain why so few samples from the Slag Pile Area were analyzed for SVOCs.

As noted in Section 2.1, the groundwater sampling and analyses were conducted in accordance with the EPA-approved Work Plan and Field Sampling Plan. SVOCs were proposed to be analyzed for in a number of wells. However, due to the absence of sufficient water in certain wells to provide for analysis, these analyses were not able to be performed. The text will be modified to indicate that the number of SVOC samples was impacted by the absence of sufficient water for sampling in certain wells.

16. **Section 4.1.4.1, OU1 Sediment and Surface Water Results, and Table 4.1.4-4.** The table shows that all six of the sediment samples from the Slag Pile Area holding pond were collected between 1991 and 1994. More recent samples have not been collected. Conditions in the holding pond likely have changed in the last 16 to 19 years. As noted in the Section 4.0 General Comments, General Comment No. 2, sediment results 16 to 19 years old may not be representative of current conditions. These data can be included in the RI report as historic contamination data. However, these data should not be included in discussions of the current nature and extent of contamination. The text in Section 4.1.4 should be revised as needed to address this issue and to include a discussion regarding the usability of sediment data collected from 1991 through 1994.

These samples were collected as part of the IEPA Site Assessments. The data were included as a matter of data completeness. The Slag Pile Area holding pond is part of the operating Carus Plant, which is not part of the CERCLA remedial investigation. This is reflected in the EPA-approved Work Plan and Field Sampling Plan, which consciously did not require sampling of the Carus operating facilities. A note will be added to the text referring to the historic data.

17. **Section 4.1.4, OU1 Sediment and Surface Water Results, Page 4-25, Paragraph 2, and Figures 4.1.4-1 through 4.1.4-11.** The text states that red symbols on Figures 4.1.4-1 through 4.1.4-11 indicate sediment contaminant concentrations exceeding the IRSLS. However, none of the figures contain any red symbols. The text and figures should be resolved as needed to resolve this discrepancy.

The comment is acknowledged. The red symbols referred to in the legend are included as a matter of standardizing the legends for numerous figures. It was not intended that all symbols in the legend be present on all figures. No change is proposed in response to this comment.

18. **Section 4.1.4.1, Slag Pile Sediment and Surface Water Results, Page 4-25.** The title of Section 4.1.4.1 is “Slag Pile Sediment and Surface Water Results,” but the text and associated tables do not address any Slag Pile surface water results. The text and associated tables should be revised as needed to resolve this discrepancy.

The text will be revised to remove reference to the Slag Pile Surface Water.

19. **Section 4.1.4.1, Slag Pile Sediment and Surface Water Results, Page 4-26, Paragraph 1, and Table 4.1.4-3.** The text states that Table 4.1.4-3 compares sediment sample concentrations to IRSLS. However, the table does not compare sediment results to the IRSLS. The text and table should be revised as needed to resolve this discrepancy.

The text will be revised to resolve this discrepancy.

20. **Section 4.1.4.1, Slag Pile Sediment and Surface Water Results, Page 4-27, Paragraph 7, and Table 4.1.4-4.** The text refers to cyanide results, but Table 4.1.4-4 does not include any cyanide results. The text and table should be revised as needed to resolve this discrepancy.

The text does not refer to cyanide results on Table 4.1.4-4. The text will be revised to add a reference to the cyanide analysis in surface water samples.

21. **Section 4.1.4.1 Slag Pile Sediment and Surface Water Results, Page 4-28, Paragraph 1, and Table 4.1.4-6.** The text states, “All analytes listed in Table 4.1.4-6 were detected at concentrations above analytical method detection limits in at least one sample, or their respective screening values were above their analytical method detection limits.” However, Table 4.1.4-6 shows results for samples having analyte screening values below their analytical method detection limits. The text and table should be revised as needed to resolve this discrepancy.

The table and text have been edited to remove reference to benzo(a)fluoranthene.

22. **Figure 4.1.4-7, Total Metals in the Little Vermilion River Surface Water.** The text boxes on this figure list analytes multiple times for the same sampling locations. The figure should be revised to list analytes only once for each sampling location.

The analytes were detected in duplicate analyses of split samples. The figures will be revised to include only the higher of the detected results.

23. **Section 4.1.4.2, LVR Sediment and Surface Water Results, Page 4-31, Paragraph 5.** The text states that dissolved and total metals surface water samples were collected from the LVR. The text should be revised to explain how and why the dissolved metals surface water samples were collected.

The analyses were conducted in accordance with the EPA-approved Work Plan and Field Sampling Plan. The text will be revised to add a reference to the potential mobility of dissolved metals relative to total metals detected.

24. **Section 4.1.4.2, LVR Sediment and Surface Water Results, Page 4-32, Paragraph 3, and Table 4.1.4-11.** The text says that “aluminum concentrations in all LVR sediment samples were below its screening value.” However, Table 4.1.4-11 shows the aluminum screening value as “NS”, which is defined as “no applicable standard”. The text and table should be revised as needed to resolve this discrepancy.

The text will be revised to delete reference to aluminum screening values.

25. **Section 4.1.4.2, LVR Sediment and Surface Water Results, Page 4-33, Paragraph 4, and Table 4.1.4-11.** The text says that “iron concentrations in all LVR sediment samples were below its screening value. However, Table 4.1.4-11 shows the iron screening value as “NS”, which is defined as “no applicable standard”. The text and table should be revised as needed to resolve this discrepancy.

The text will be revised to delete reference to iron screening values.

26. **Section 4.1.4.2, LVR Sediment and Surface Water Results, Page 4-34, Paragraph 1, and Table 4.1.4-11.** The text says that “selenium concentrations in all LVR sediment samples were below its screening value.” However, Table 4.1.4-11 shows the selenium screening value as “NS”, which is defined as “no applicable standard”. . The text and table should be revised as needed to resolve this discrepancy.

The text will be revised to delete reference to selenium screening values.

27. **Section 4.1.4.2, LVR Sediment and Surface Water Results, Page 4-34, Paragraph 7, and Table 4.1.4-12.** Table 4.1.4-12 shows that results for two samples (collected from one surface water sampling location) exceed the ESV for cyanide. However, the text discussing the LVR surface water results does not mention cyanide. The text and table should be revised as needed to resolve this discrepancy.

The text will be revised to refer to the cyanide detections.

28. **Section 4.1.5.1, Vertical Extent of Metal Contamination in Soil and Groundwater, Page 4-38, Paragraph 4, and Figure 4.1.5-3.** The text states that Figure 4.1.5-3 shows metals concentrations above the IRSIs. However, the figure does not show any results above the IRSIs. The text and figure should be revised as needed to resolve this discrepancy.

The text and figure will be revised to agree with the table.

29. **Section 4.1.5.1, Vertical Extent of Metal Contamination in Soil and Groundwater, Page 4-39, Paragraph 3, and Figure 4.1.5-5.** Figure 4.1.5-5 shows wells and borings up to 300 feet away from the cross-section line A-A'. The text says that this approach is "standard protocol for projecting wells onto a cross-section." However, the cross-section is not clear with the wells at the toe of the Slag Pile projected onto it. The elevation difference between the top and toe of the Slag Pile is significant. Wells located at the toe of the Slag Pile should be removed from this cross-section, and a new cross-section should be created showing these wells at the toe of the Slag Pile. In addition, the text should be revised as needed to discuss the revised cross-sections.

The comment is acknowledged. The text will be revised to include more explanation of the wells projected onto the cross sections. The extreme slope of the Slag Pile will result in apparent anomalies as a result of projection of wells off the alignment of the cross section. However, additional cross-sections will not, in our view, significantly aid readers in understanding the configuration of the slag pile, so it is not proposed to include additional cross sections. No changes to the cross sections are proposed.

30. **Figures 4.1.5-5 through 4.1.5-12.** These figures should be revised to show groundwater elevations, especially on the cross-sections that show analyte concentrations in groundwater when there are multiple zones of groundwater, confined or perched aquifers, etc.

Groundwater elevations could be shown on individual wells. However, due to the projection of wells onto the cross section, and the alignment of the cross section not being uniform, water levels cannot be correlated between wells. The inclusion of these water levels would give the appearance of multiple water levels in this area when the data do not support this interpretation. A paragraph will be added to the text regarding the projection and the resulting anomalies in the figure.

31. **Section 4.1.5.1, Vertical Extent of Metal Contamination in Soil and Groundwater, Page 4-40, Paragraph 1, and Figure 4.1.5-7.** The text states that groundwater containing lead at concentrations

above the MCL is limited to wells completely screened in the slag material. However, Figure 4.1.5-7 shows multiple wells screened in unconsolidated native media with groundwater lead concentrations above the lead MCL. The text and figure should be revised as needed to resolve this discrepancy.

The appearance of wells with lead exceedances screened in material other than the slag is the result of the projections and alignment of the cross section. The interpretation of the material in which the well is screened must be based on the boring log and well construction log. A paragraph will be added to the text regarding the projection of data onto the cross section.

32. **Section 4.1.5.1, Vertical Extent of Metal Contamination in Soil and Groundwater, Page 4-40, Paragraph 1, and Figure 4.1.5-7.** Figure 4.1.5-7 shows ISW-002 screened in the unconsolidated native media. The text states that Figure 4.1.5-7 shows ISW-002 screened in bedrock, but the figure is distorted because of the projection, and the well actually is screened in slag. If a projection causes the figure to be incorrect, then the projection should not be used. The text and figure should be revised as needed to address this issue.

The text will be revised to clarify the material in which the well is screened. Distortions which result from the projection of wells onto the cross section are unavoidable. The text is intended to provide that explanation. The cross section is not considered incorrect, but rather distorted by the projection. The text will be revised. No change to the cross section is proposed in response to this comment.

33. **Section 4.1.5.1, Vertical Extent of Metal Contamination in Soil and Groundwater, Page 4-42, Paragraph 1, and Figure 4.1.5-12.** Figure 4.1.5-12 shows SB-308 and P-18 as co-located. The text says that they are adjacent locations and that zinc therefore has low soil mobility because the zinc detected in SB-308 was not detected in groundwater samples from P-18. However, the two locations are actually about 200 feet apart. The text should be revised to note the distance between these locations and to discuss the mobility of zinc in light of this distance, and Figure 4.1.5-12 should be revised to show that the two locations are not co-located but about 200 feet apart.

The text will be revised to clarify the distance between the two wells. The text will also be revised to discuss the interpretation of the mobility of zinc based on the data from the boring and well samples. No change is proposed to the figure.

34. **Section 4.1.5.5, Vertical Extent of Contamination in Soil and Groundwater, Pages 4-37 through 4-44.** The text does not discuss the vertical extent of sediment contamination, while in Section 4.1.6 the horizontal extent of sediment is characterized. In addition, all sediment samples were collected

from 0 to 0.667 ft bgs. Sediment samples from deeper intervals should be collected for remediation purposes. The text should be revised as needed to address these issues.

The comment is acknowledged. However, the samples were collected in accordance with the EPA-approved Work Plan and Field Sampling Plan because this interval was considered the most relevant interval for human health and ecological risk exposures. Discussion of the vertical extent of contamination within this small interval does not seem useful. Because the Risk Assessment has not identified an unacceptable risk from sediment exposure, no revision to the text is necessary.

35. **Section 4.1.6.2, Horizontal Extent of Contamination in Groundwater, Paragraph 6, Page 4-51.**

The text states that that horizontal extent of VOCs in groundwater in the Plant Area has been identified. However, no groundwater VOC samples were collected from the northern and western portions of the Plant Area. VOCs are COIs along the southern border of OU2, which means that they likely are present across the boundary in OU1. The text should be revised to state that additional groundwater samples should be collected from the western and northern portions of the Plant Area and analyzed for VOCs.

The wells along the northern and western portions of the Plant Area did not have sufficient water to allow for sampling. The groundwater gradients in this area do not show a strong gradient of flow crossing the boundary between OU1 and OU2. The presence of VOCs in wells on OU2 does not indicate that VOCs should be present in wells adjacent to those wells on OU1. It is our opinion that the existing data do show the limit of VOC contamination on OU1. A paragraph will be added to the text regarding VOCs in the border area groundwater.

36. **Section 4.1.6.3, Horizontal Extent of Contamination in Sediment and Surface Water, Page 4-59,**

Paragraph 3. The text states “that there may be other sources of nickel impact upstream of OU1.”

There are additional nickel exceedances of the screening values upstream of OU1. The text should be revised to include these other potential nickel sources.

The objective of this RI was to characterize the nature and extent of contamination on and from the Matthiessen and Hegeler Zinc Company Site. Identification of contamination sources off site or upstream is beyond the scope of the RI for this site. A note will be inserted in the text referring to the upstream exceedances, but noting that identification of the sources was beyond the scope of the investigation.

37. **Section 4.3.1.1, OU1 Soil Results, Page 4-261, Paragraph 2.** The text states that “arsenic, cadmium, lead, manganese, lead, and zinc” were the metals most frequently detected at concentrations above screening values in all OU1 soil samples. Lead is listed twice and should only be listed once. Additionally, text in Section 4.1.2 does not include cadmium or zinc in the list of most frequently detected analytes at concentrations above screening values. The text in Sections 4.3.1.1 and 4.1.2 should be revised as needed to resolve these discrepancies.

The text will be revised to correct these discrepancies.

38. **Section 4.3.1.2, OU1 Groundwater Results, Page 4-262, Paragraph 2.** The text states that “arsenic, cadmium, manganese, and zinc” were the metals most frequently detected at concentrations above screening values in all OU1 groundwater samples. Text in Section 4.1.3 does not include zinc in the list of most frequently detected analytes at concentrations above screening values. However, chromium (total) and cobalt are listed in Section 4.1.3. The text in Sections 4.3.1.2 and 4.1.3 should be revised as needed to resolve these discrepancies.

The text will be revised to correct these discrepancies.

39. **Section 4.3.1.3, OU1 Sediment and Surface Water and Sediment Results, Page 4-263, Paragraph 1.** The text states that “arsenic, cadmium, copper, lead, nickel, silver, and zinc” were the metals most frequently detected at concentrations above screening values in all OU1 sediment samples. Text in Section 4.1.4 does not include silver in the list of most frequently detected analytes at concentrations above screening values. However, chromium (total) and mercury are listed in Section 4.1.4. The text in Sections 4.3.1.3 and 4.1.4 should be revised as needed to resolve these discrepancies.

The text will be revised to resolve these discrepancies.

40. **Section 4.3.3.1, Border Areas Summary, Page 4-268, Paragraph 4.** The text states that “manganese is the only contaminant in addition to arsenic that also exceeds the BTV in addition to the RRS and IRS.” The BTVs for all contaminants other than arsenic and manganese are less than the RSLs and are therefore exceeded whenever an RSL is exceeded. The text should be revised as needed to address this issue.

The text will be revised to clarify the relationship between the background threshold values and the RSLs.

41. **Section 4.3.3.2, Border Areas Groundwater Summary, Page 4-269, Paragraph 1.** The text incorrectly refers to Figure 4.3.3-1 for border area monitoring wells. The text should be revised to refer to Figure 4.3.3-2.

The text will be revised as needed.

42. **Section 4.3.3.2, Border Areas Groundwater Summary, Page 4-270, Paragraph 1, and Figure 4.3.3-2.** The text lists MW18, MW19, and MW22 at 40, 175, and 380 ft, respectively, from the LVR. According to Figure 4.3.3-2, MW19 appears to be further from the LVR than MW22. The text and figure should be revised as needed to address this issue. Additionally, the text does not discuss the distance of MW08 from the LVR. The text should be revised as needed to address this issue.

The text will be revised as needed to address these issues.

43. **Section 4.3.3.2, Border Areas Groundwater Summary, Page 4-270, Paragraph 1.** The text states, “All four OU2 monitoring wells are screened in WBZ2.” This statement is incorrect – MW08 is screened in WBZ1. The text should be revised accordingly.

The text will be revised to correct this issue.

44. **Section 4.3.3.2, Border Areas Groundwater Summary, Page 4-270, Paragraph 2.** The text incorrectly refers to Table 4.3.3-2 for analytical results for wells along the border areas. The text should be revised to refer to Table 4.3.3-3.

The text will be revised to correct this issue.

45. **Section 4.3.3.2, Border Areas Groundwater Summary, Page 4-270, Paragraph 4.** The text incorrectly refers to Table 4.3.3-2 for contaminants present in groundwater border area wells. The text should be revised to refer to Table 4.3.3-4.

The text will be revised to correct this issue.

46. **Section 4.3.3.2, Border Areas Groundwater Summary, Page 4-271, Paragraph 1, and Tables 4.1.3-1 and 4.1.3-8.** The text states, “The following wells in the Slag Pile Area of OU1 did not show any exceedances of the total or dissolved metals: P15A, MW301H, MW301S, MW303S, MW305H, MW305S, MW305R, MW320H.” However, Table 4.1.3-1 does not list wells P15A, MW301H, MW301S, MW303S, MW305S, MW305R, and MW320H as having *any* historical data. Therefore, there is no record that these wells were ever sampled. In addition, according to Table 4.1.3-8, the

manganese results for MW305H exceed the Tapwater RSL. The text and Tables 4.1.3-1 and 4.1.3-8 should be revised as needed to resolve these discrepancies.

The comment is acknowledged. The text will be revised to clarify the wells were part of the monitoring program for OU1, even if there are no analytical data for some wells. Many of the wells in the Slag Pile were found to be dry after installation. For each of the quarterly rounds when the OU1 groundwater was sampled, all wells were attempted to be sampled. The absence of analytical data is an indication of the lack of groundwater in those wells rather than an indication that the wells were not included in the monitoring effort. The wells that were dry during the sampling effort will be identified on the appropriate figures to facilitate the understanding of why there are no data for these wells.

SECTION 5.0 GENERAL COMMENTS

1. The introduction of Section 5 should provide a clear discussion of the difference between the terms “contaminants of interest (COI)” used in the presentation of the Site characterization results in Sections 4 and 5 and “contaminants of potential concern (COPC)” discussed in the risk assessments. It is important that the introductory sections of Sections 4 and 5 (as well as the HHRA and ERA) make very clear the distinction between the COIs discussed in Sections 4 and 5 (contaminants at concentrations exceeding one or more screening levels) and the COPCs discussed in the risk assessments (contaminants selected based on an EPA-mandated risk assessment procedure). The discussions of COIs should be consistent in Sections 4 and 5, and the COIs discussed in Section 5 should be checked to ensure they include all risk and hazard drivers discussed in the risk assessments.

The comment is acknowledged. The introductory text to Section 5 will be revised to include the requested explanation.

2. The constituents listed as COIs should be checked for consistency. For example, the COIs are inconsistent between Tables 4.3.1-1, 4.3.2-1, 5.1-1, and 5.1.2-1; the bulleted list of COIs in Section 5.3; and relevant text throughout Section 5.

The tables will be reviewed and corrected as necessary.

3. Additional explanation of the organization and content of the subsections would be helpful. Currently, the opening paragraphs and sentences of many sections and subsections do not adequately define the content of the following text. For example, some sections discuss inorganic contaminants, some discuss organic contaminants, some discuss both, some discuss single contaminants, and some

discuss groups of related contaminants. If the title of a particular section does not make the content of the section clear (as is the case for Section 5.1.2.1, Inorganic Partitioning, and Section 5.3.1.1, Aluminum, among others), then the introductory sentences must do so. In particular, corrections must be made to the introductory paragraph of Section 5.3, which states that the section discusses inorganic contaminants. This statement is true for Sections 5.3.1 and 5.3.6 but not for Sections 5.3.2 through 5.3.5, which discuss organic contaminants.

The introductory paragraphs and opening sentences will be reviewed and edited as needed to clarify the content of the subsections and paragraphs. It is not intended to include a general rewriting of this section.

SECTION 5.0 SPECIFIC COMMENTS

1. **Section 5.3.1.1, Expected Chemical Fate and Transport – Aluminum, Page 5-8, and Table 5.5.2-1.** This section discusses the fate and transport of aluminum, including its chemistry in acidic to neutral water solutions. Although there is little evidence of alkaline conditions at the Site as shown in Table 5.5.2-1, some remedial technologies do result in considerably alkaline conditions. Therefore, the text should be revised to discuss the fact that in alkaline solutions, the soluble tetrahydroxyaluminum ion $\text{Al}(\text{OH})_4^-$ forms, and similar revisions should be made to Table 5.1.2-1 as needed.

The text will be revised as needed to discuss the potential mobility under alkaline conditions. Note will be made that if in the remedial design, alkaline conditions are potentially generated, this aspect of aluminum mobility will be considered. As needed, similar changes will be included in Table 5.1.2-1.

2. **Section 5.3.1.13, Expected Chemical Fate and Transport – Manganese, Page 5-17, and Table 5.1.2-1.** This section discusses the fate and transport of manganese. However, the text barely mentions the oxidation states Mn(VII) (permanganate) and Mn(VI) (manganate). In 1915, the Carus Chemical Company began producing potassium permanganate by electrolytic oxidation of alkaline manganate solutions or other strong oxidation means and continues to produce potassium permanganate and related compounds. Therefore, these highly oxidized manganese species may have been released to the environment. Both manganate and permanganate are sufficiently strong oxidizers and likely have been reduced through reactions with soil components, but the text should be revised to discuss this aspect of manganese chemistry, and Table 5.1.2-1 should be revised as needed to include this information.

The oxidation states Mn(VII) and Mn(VI) are not likely to persist in the environment. Additionally, these species are extremely soluble, again suggesting they would not be persistent in the environment. As needed, reference will be made to these oxidation states.

3. **Section 5.3.2, Expected Chemical Fate and Transport – VOCs, Page 5-22, and Table 4.3.2-1.**

The first sentence in this section should refer to Table 4.3.2-1. Additionally, the last sentence on this page lists eight VOCs as detected above screening levels in OU2 but does not indicate which media the VOCs were detected in. The text should be revised to provide this information. Also, Table 4.3.2-1 lists only chloroform, trichloroethene, and vinyl chloride as the VOCs present in the OU2 summary of results. The VOCs listed in Table 4.3.2-1 and discussed in the text in this section must be checked for consistency and corrected as appropriate to resolve discrepancies. Finally, Bullet 4 and the second sentence of Section 5.3.2 incorrectly refers to “cis-1,2-dichloroethane.” Apparently, the text should be revised to refer to cis-1,2-dichloroethene (DCE).

The text will be revised to make this correction. The COI identified on OU1 was 1,2-dichloroethane (DCA). The COI identified on OU2 was cis-1,2-dichloroethene (DCE).

4. **Section 5.3.3, Expected Chemical Fate and Transport – SVOCs, Page 5-28.** The last paragraph on this page discusses polycyclic aromatic hydrocarbons (PAH). PAHs include acenaphthene, acenaphthylene, and naphthalene, but the list of relevant PAHs in this paragraph omits these three compounds. In addition, the list of PAHs includes hexachlorobenzene, which is not typically considered a PAH by any definition. Finally, the heterocyclic tricyclic aromatic compound carbazole is not included in the list, although most environmental chemists would include it as a PAH because its relevant chemistry is very similar to tricyclic PAHs such as anthracene. The text and associated tables should be revised as needed to address these issues.

The text and tables will be revised to address these issues.

5. **Section 5.3.5, Expected Chemical Fate and Transport – Pesticides, Page 5-32.** This section discusses pesticides, and the third paragraph on this page refers to certain of the selected pesticides as “organochlorine pesticides.” However, all of the pesticides discussed in this section and listed in Table 5.1-1 are organochlorine compounds. The text should be corrected as needed.

The text will be revised to address this discrepancy.

6. **Section 5.4.1.1, SEP Results (OU1), Pages 5-37 and 5-38, Tables 5.4.1-1 and 5.4.1-2, and Figures 5.4.1-1 through 5.1.4-7.** This section, Tables 5.4.1-1 and 5.4.1-2, and Figures 5.4.1-1 through 5.4.1-

7 present the results of the sequential extraction procedure (SEP) studies. On Page 5-38 the text describes Step 5 of the sequence, which determines the “Organic Phase.” However, the tables and figures call this Step 2 (“Organic Fraction”). The organic fraction determination probably is the fifth step because it involves the use of the strong oxidizer hypochlorite under alkaline conditions. In addition, such alkaline hypochlorite oxidation is usually a late step in the many versions of the SEP discussed in scientific literature. The text, tables, and figures should be revised as needed to resolve this discrepancy and should all reflect the actual procedures used in the SEP studies.

The text will be revised as needed to clarify the reference to the organic step in the SEP analysis.

7. **Section 5.4.1.2, SPLP Results (OU1), Page 5-45.** The introduction paragraph in this section contains a typographical error (“A.”) in the last line. The text should be corrected to eliminate this error.

This typographical error will be corrected.

8. **Section 5.4.2, Potential Migration of Contaminants in Groundwater (OU1), Page 5-49.** This section contains very little discussion of contaminant migration in groundwater. For example, the text should provide some discussion of whether groundwater contaminants are expected to migrate horizontally toward the LVR, vertically to deeper WBZs, or both. In addition, the text incorrectly refers to “cis-1,2-dichloroethane” and apparently should refer to cis-1,2-DCE instead.

Text will be added to make additional reference to migration in groundwater, both vertically and horizontally. Additionally, the text will be corrected with reference to DCA and DCE.

9. **Tables 5.1-1, 4.3.1-1, and 4.3.2-1, and Section 5.** Table 5.1-1 requires careful proofreading because it contains obvious errors. For example, the molecular weight of ethylbenzene has an extra digit. In addition, the first contaminant listed in Table 5.1-1 is 1,2-dichloroethane (DCA), but the fifth contaminant listed is cis-1,2-DCA. The latter compound does not exist, although it is listed in Table 4.3.1-1 and also discussed in various sections of the text (such as Sections 5.3.2 and 5.4.2 for example). It is assumed that all references in the text and tables to cis-1,2-DCA are typographical errors and should actually be to cis-1,2- DCE. If this assumption is correct, the text (especially in Section 5.3.2) and tables must be corrected as needed. For example, in Table 5.1-1, the molecular weight of cis-1,2-DCE is two units less than that of 1,2-DCA. Furthermore, several compounds listed in Table 5.1-1 are not included in either Table 4.3.1-1 or Table 4.3.2-1, including 1,2-DCA; benzene; bromodichloromethane; ethylbenzene; tetrachloroethene; and xylene. Finally, Table 4.3.1-1 includes

acenaphthene, acenaphthene, and carbazole as COIs, but Table 5.1-1 does not list these COIs. The tables should be revised as needed to resolve all discrepancies.

The tables will be carefully reviewed and edited as needed. Those edits noted in the review comments will be made. Additional corrections will be made as they are identified.

10. **Tables 5.1.2-1, 4.3.1-1, and 4.3.2-1.** This table omits selenium, silver, and cyanide, all of which are listed as COIs in Table 4.3.1-1, as well as asbestos, which is listed in Table 4.3.2-1. The lists of contaminants in the Section 4 and Section 5 tables must be consistent.

The tables will be reviewed and edited as necessary to be consistent.

SECTION 6.0 GENERAL COMMENTS

1. The text in Section 6 refers to the Slag Pile several times as the “6-acre slag pile.” However, in other sections, it is described as occupying 10.5 acres. This discrepancy should be resolved.

The use of the phrase "6-acre slag pile" was a holdover from previous reports that had identified that acreage. The correct area is 10.5 acres. The text will be revised to make this consistent throughout.

2. Section 6 appears to be a summary of previous sections of the RI report. In light of this fact, the text should be revised as needed to address all comments on the previous sections. Therefore, all revisions to Sections 3, 4, and 5 should be reflected in this section as well.

Revisions will be reviewed in earlier sections of the RI Report and incorporated in Section 6 as necessary.

SECTION 6.0 SPECIFIC COMMENTS

1. **Section 6.1.1.1, Surface Features of OU1, Page 6-2, Paragraph 0.** The Slag Pile is referred to as the “17.7-acre slag pile.” However, in other sections, it is described as occupying 10.5 and 6 acres. The correct area of the Slag Pile should be used consistently throughout the report.

The text will be revised to refer to the 10.5 acre Slag Pile.

2. **Section 6.1.1.3, Hydrogeology of OU1, Page 6-4, Paragraph 0, Bullets 1 and 2.** This bulleted list appears to be the first time that WBZ1 and WBZ2 are defined specifically for OU1. This definition should appear much earlier in the report, preferably in Section 3.0, when the OU1 hydrogeology is

introduced. As described in the site-wide hydrology section in Section 3.0 and for OU2, it was assumed that WBZ2 consists only of bedrock geology and that WBZ1 includes all Quaternary-aged unconsolidated materials (till, soil, and fill). However, this bulleted definition of each WBZ indicates that OU1 includes the Quaternary-aged till deposit (the Lemont Formation) as part of WBZ2. This definition dramatically differs from the OU2 and site-wide hydrogeology discussions and would significantly impact the site-wide groundwater interpretation. This discrepancy must be resolved throughout Section 6 (including the discussion of groundwater flow in WBZ2 on Page 6-5) as well in the following sections: (1) Section 3.2.3, where the WBZs should be first identified (and subsequently be consistent with the OU2 [Section 3.3.3] and site-wide [Section 3.4.3] discussions); (2) Section 4, where groundwater data should be described according to WBZ; and (3) Section 5, which discusses the fate and transport in each WBZ.

The text will be revised in earlier sections of the RI Report to refer to the WBZs. The description of the WBZs includes the glacial till in WBZ1.

3. **Section 6.1.1.3, Hydrogeology of OU1, Page 6-4, Paragraph 1.** The phrase the “absence of aquitards” seems to indicate that the groundwater system effectively is a single system. As noted in the Section 3.0 General Comments, General Comment No. 3, this statement contradicts previous text and figures describing WBZ1 and WBZ2. Vertical movement of groundwater between WBZ 1 and WBZ 2 is possible, indicating some hydraulic connectivity. However, it is not clear that groundwater is present in a single unit. The text should be revised as needed to resolve this discrepancy.

The text will be revised to clarify that the description of the absence of aquitards is in reference to separation within WBZ1.

4. **Section 6.1.1.3, Groundwater Flow in WBZ1, Page 6-4, Paragraph 1.** The text refers to Figures 6.1.1-2 and 6.1.1-3. However, no such figures are included in the electronic or hard-copy of the RI report, and these figures are not listed in the list of Figures in the table of contents. Either the text and list of Figures should be revised to eliminate the reference to these figures, or the figures should be included in the final RI report.

The text will be revised to make reference to Figures 3.2.3-2 and -4.

5. **Section 6.1.1.3, Groundwater Flow in WBZ1, Page 6-4, Paragraph 3.** The pronounced groundwater gradients from the Slag Pile and from the bedrock wells are described as “mimicking” each other. Therefore, the text suggests that groundwater is travelling along the slag/bedrock

interface. It is unclear how the similar gradients relate to the location and depth of groundwater. The text should be revised to clarify this issue.

The text will be revised to clarify this issue.

SECTION 7.0 GENERAL COMMENT

1. Section 7 should be revised as necessary to incorporate any changes made to the HHRA (Appendix RA) as the result of comments on the HHRA.

This comment is acknowledged. Revisions to the HHRA will be reviewed and modifications made to Section 7, as necessary.

SECTION 8.0 GENERAL COMMENT

1. Section 8 should be revised as necessary to incorporate any changes made to the ERA (Appendix RA) as the result of comments on the ERA.

This comment is acknowledged. Revisions to the ERA will be reviewed and modifications made to Section 8, as necessary.

SECTION 8.0 SPECIFIC COMMENTS

1. **Section 8.1.1, OU1 Screening Level Ecological Risk Assessment (Steps 1 and 2), Page 8-4, Paragraph 3, Bullet 2.** This bullet provides the rationale for not conducting a baseline ERA for the Slag Pile at OU1. The last statement states that the physical substrate creates a poor habitat for ecological receptors. Although the substrate is not ideal, large portions of the Slag Pile Area are vegetated and support a number of ecological receptors. In addition, these portions of the Slag Pile contain complete exposure pathways. Either the last sentence in this bullet should be deleted or else text should be added to note that although portions of the Slag Pile are poor habitat, other areas contain established vegetation and exposure of ecological receptors is occurring and will continue to occur in these areas.

This comment is identical to the comment on Appendix RA, Section 3.0, Specific Comment 5. Revisions to the text will be made consistent with our response to that comment.

2. **Section 8.1.2.1, Baseline Problem Formulation (Step 3), Page 8-6, Paragraph 2.** The text should be revised to define the acronym ESL.

The text will be revised to define this acronym.

SECTION 9.0 GENERAL COMMENTS

1. Section 9.3 should be revised as necessary to incorporate any changes made to the HHRA (Appendix RA) as the result of comments on the HHRA.

The text will be revised as appropriate to incorporate changes made in the HHRA Appendix.

2. Section 9.4 should be revised as necessary to incorporate any changes made to the ERA (Appendix RA) as the result of comments on the ERA.

The text will be revised as appropriate to incorporate changes made in the Eco RA Appendix.

3. The text in Section 9.5.2 and Table 9.5.1-1 summarizing the OU1 data limitations and uncertainties should be revised to include the data limitations mentioned in the comments on previous sections, including the data limitations summarized below.

- The detection limits of some VOCs, PCBs, and pesticides are above screening values.
- Many soil, sediment, groundwater, and surface water results are for samples collected and analyzed between 1991 and 1994. More recent data should be used.
- All Slag Pile surface water results are for samples collected and analyzed between 1991 and 1994. More recent data should be used.
- The small sample group numbers (such as two SVOC samples for Slag Pile groundwater) for some media and analytes are not adequate to allow full characterization of the nature and extent of contamination.

The review comment is acknowledged. Reference will be added to the discussion of data limitations and uncertainties with regard to the detection limits for some analytes being above the screening values. The historical data (1991-1994) for soil, sediment, groundwater and surface water were included as a matter of completeness in accordance with the agreement of EPA and were supplemented by more recent data. The inclusion of the older data does not constitute a data limitation or uncertainty. The Slag Pile surface water results referenced in the comment are for the Carus holding pond, which is part of an operating NPDES-regulated discharge system. As reflected in the EPA-approved Work Plan and Field Sampling Plan, this was not considered a subject of the RI for this Site and the absence of more recent data is not considered a data limitation or uncertainty. This issue is further addressed in the response to Section 4.0 Specific Comment 16, above. The only

other significant surface water present on the Slag Pile is in the area of a seep originating on OU2, and recent data associated with that feature were included in the report. The number of samples obtained was in compliance with the EPA-approved Work Plan and Field Sampling Plan and was, in some cases, impacted by the lack of recoverable groundwater in wells selected for sampling. The small number of samples is not considered a data limitation or uncertainty.

SECTION 9.0 SPECIFIC COMMENTS

1. **Section 9.1.1, OU1 Nature and Extent of Contamination.** This section does not include summaries of the surface water or Slag Pile sediment results. This section should be revised to include these summaries.

The text will be revised to add reference to the Slag Pile surface water and sediment results. The LVR will also be discussed.

2. **Section 9.1.1, OU1 Nature and Extent of Contamination, Page 9-1, Paragraph 3.** The text states sampling before the RI was conducted “from 1992 through 1994.” Sample results from 1991 are included in the Section 4.1 discussion and the Section 4.1 tables and figures. The text, tables, and figures should be revised as needed to resolve this discrepancy.

The text will be revised as needed to resolve this discrepancy.

3. **Section 9.1.1, OU1 Nature and Extent of Contamination, Page 9-2, Paragraph 1.** The text states that “impacted groundwater was evident in both WBZ1 and WBZ2.” However, the nature and extent discussion in Section 4.1 never discusses groundwater in terms of these WBZs. The text should be revised as needed to resolve this discrepancy.

The text in Section 4 will be revised to resolve this discrepancy.

4. **Section 9.1.1, OU1 Nature and Extent of Contamination, Page 9-2, Paragraph 1.** The text lists the COIs based on the LVR sediment sample results. However, cyanide is not listed as a COI. The text in Section 4.1.4.2, Page 4-34, notes that cyanide was detected in LVR sediment at concentrations above its screening value. The text should be revised as needed to resolve this discrepancy.

The text will be revised to resolve this discrepancy.

5. **Section 9.1.2, OU1 Contaminant Fate and Transport, Page 9-2, Paragraph 1.** Text states that “no airborne contamination was observed during the investigation of OU1.” However, there is no evidence that any air samples were collected from OU1, and Section 4.1 does not discuss air sampling. Either this statement should be deleted or the text should be revised to indicate the source of this information.

The statement in the text is correct and supported by data. The text will be revised to add a reference to air monitoring performed during the test pit trenching to define the limits of the Slag Pile Area and limited asbestos sampling.

6. **Section 9.3.3, Site Summary, Page 9-11, Paragraph 3, and Table RA-2-1.** This section summarizes the potential cumulative risks and hazards from OU1 and OU2 and refers to “Table RA-X.” This table is Table RA-2-1. Table RA-2-1 should be included in the RI report also and not only in Appendix RA. Therefore, the table should be renumbered as an RI report table and added to the list of Figures in the table of contents, and the text in this section should be revised to refer to the correct table number.

The table reference will be corrected. However, it is not proposed to reproduce the table as part of the RI. The cross reference to the table in the Risk Assessment appendix is considered sufficient.

7. **Section 9.4.1, OU1 ERA Summary, Page 9-12, Paragraph 1, Bullet 2.** This bullet provides the rationale for not conducting a baseline ERA for the Slag Pile at OU1. The last statement states that the physical substrate creates a poor habitat for ecological receptors. Although the substrate is not ideal, large portions of the Slag Pile Area are vegetated and support a number of ecological receptors. In addition, these portions of the Slag Pile contain complete exposure pathways. Either the last sentence in this bullet should be deleted or else text should be added to note that although portions of the Slag Pile are poor habitat, other areas contain established vegetation and exposure of ecological receptors is occurring and will continue to occur in these areas.

This comment is identical to the comment on Appendix RA, Section 3.0, Specific Comment 5. Revisions to the text will be made consistent with our response to that comment.

APPENDIX RA

APPENDIX RA GENERAL COMMENT

1. Illinois EPA states that all carcinogenic PNAs must be carried through into the risk assessment regardless of whether they exceed individual screening levels.

The HHRA report will be revised to carry through all potentially carcinogenic polynuclear aromatic hydrocarbons (PAH) for all exposure areas whenever at least one potentially carcinogenic PAH exceeded its screening level in that exposure area.

As described in the Consensus Document, carcinogenic PAHs were assessed independently at the screening level and in the risk characterization. The screening values were conservatively selected as the lowest of (1) EPA residential and industrial RSLs, (2) the Illinois Tiered Approach to Corrective Action Objective (TACO) values, and (3) the Illinois non-TACO values. The TACO and non-TACO values considered residential as well as industrial and construction worker scenarios. Given the conservative nature of the screening process and that future land use is expected to be commercial/industrial, it is unlikely that constituents not identified as COPCs would contribute significantly to the overall risk estimates or affect the remedy selection. However, per Illinois EPA's request, if one carcinogenic PAH (i.e., benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene) exceeds an individual screening level, all seven will be carried through into the risk assessment.

2. Please replace the word recreator with recreationalist throughout the risk assessment report.

The word "recreator" will be replaced with the word "recreationalist" throughout the HHRA.

APPENDIX RA TABLE OF CONTENTS SPECIFIC COMMENTS

1. **Table of Contents, Tables, Section 2.0, Page x.** The list of Tables in the table of contents incorrectly identifies the table titled "Risk and Hazard Summary – Adult Trespasser, OU2 Exposure Area 3, RME" as Table RA-S2-31.RME. The list should be revised to refer to Table RA-S2-30.RME.

The table number will be corrected within the table of contents.

2. **Acronyms and Abbreviations, Page xvi.** The acronyms “ASO” and “CSO” are used in the text (see Page 2-16). However, these acronyms are not defined in the text or in the list of Acronyms and Abbreviations. The text should be revised as needed to define ASO and CSO on their first occurrence, and the list of Acronyms and Abbreviations should be revised to provide these definitions.

The Acronyms and Abbreviations page will be revised to include “ASO” and “CSO.” ASO and CSO are defined as Abandoned Sewer Outfall and Combined Sewer Overflow, respectively. The text will be revised to define these acronyms on their first occurrence.

APPENDIX RA SECTION 1.0 SPECIFIC COMMENTS

1. **Section 1.2.3.1.3, Page 1-9, Paragraph 1.** Bullet 3 states that “several SVOCs were above SVs in sediment samples from the Slag Pile and the LVR.” Bullet 3 should be revised to identify the specific SVOCs. Similarly, Bullet 5 states, “Concentrations exceeded SVs for seven (7) of these pesticides.” Bullet 5 should be revised to identify the specific pesticides.

The text will be revised to identify the specific constituents that exceed SVs.

2. **Section 1.2.4, Page 1-18, Paragraph 2.** The last sentence of this paragraph states, “(Note: the contribution of Site groundwater to the overall flow of the LVR has not been determined and may be inconsequential.)” Because the contribution of Site groundwater to the overall flow of the LVR has not been determined, this contribution could be significant. Therefore, the note should be revised to delete the phrase “and may be inconsequential.”

The phrase “and may be inconsequential” will be deleted as requested.

3. **Section 1.2.5.1, Page 1-20, Paragraph 1, Bullet 1.** Bullet 1 describes the Carus Plant exposure area. The last sentence in this bullet begins “The Carus Plant is border to the north by OU2 . . .”. This phrase should be revised to read “The Carus Plant is bordered to the north by OU2 . . .”

The text will be revised to correct this grammatical error.

APPENDIX RA SECTION 2.0 GENERAL COMMENT

1. In most cases, the text presents and discusses cumulative cancer risks and hazard indices (HI) under reasonable maximum exposure (RME) and central tendency exposure (CTE) conditions. However, the text does not provide sufficient detail regarding the media, pathways, and COPCs driving

(contributing most significantly to) these cumulative risks and hazards. The text should be revised to provide medium-specific total risks and hazards and also identify pathway- and COPC-specific risks and hazards that are greater than or equal to 1E-06 and greater than 1, respectively.

The OU1 discussion of risks and hazards is less detailed than that for OU2; however, the OU1 discussion provides sufficient detail when reviewed in conjunction with the RAGS Part D Tables. Nonetheless, information specifically requested in Section 2.0 Specific Comments 30, 32, 33, 34, 35, and 38 will be provided; however, no other changes are proposed.

APPENDIX RA SECTION 2.0 SPECIFIC COMMENTS

1. **Section 2.0, Page 2-2, Paragraph 2.** Bullet 8 in this paragraph refers to “Section 2.8: HHRA References.” No such section exists. All references for the entire risk assessment (including the ERA) are presented in Section 6.0. Therefore, Bullet 8 should be eliminated.

The bullet will be eliminated from the text.

2. **Section 2.1, Page 2-4, Paragraph 0.** In discussing the Slag Pile, the text states that surface water runoff from the pile could flow into the LVR. The text also mentions that constituents in soil could leach to groundwater, which in turn is believed to discharge into the LVR. The text should be revised to mention two other potential transport mechanisms that may allow constituents from the Slag Pile to reach the LVR. First, constituents in slag already located in the LVR may leach directly into the LVR. Second, constituents in slag may leach to groundwater, which in turn is believed to discharge into the LVR.

The text will be revised to acknowledge these two potential migration pathways.

3. **Section 2.1.1.1, Page 2-5, Footnote 1.** Footnote 1 includes the phrase “the surface soil dataset may no long represent...” This phrase should be revised to read “the surface soil dataset may no longer represent...”

The text will be revised to correct this grammatical error.

4. **Section 2.1.1.1, Page 2-6, Bullet 3.** This bullet discusses the current and future trespasser receptor at OU1. The first sentence states, “Perimeter fencing, security measures, and a lack of ‘attractive nuisances’ generally preclude trespassers from accessing the Carus Plant.” To clarify the extent and

likelihood of any trespassing at the Carus Plant, the text should be revised to discuss if trespassing has in fact ever been observed at the Carus Plant and if so, where and how frequently.

As part of National anti-terrorism measures, security procedures at chemical manufacturing facilities, including the Carus Plant, are routinely audited by the Department of Homeland Security. While it is impossible to say that trespassing has never occurred, Carus has no record of any recent trespass events at the plant. Based on these considerations, trespassing is likely to be rare and, thus, of *de minimis* risk. The text will be revised to include this additional information.

5. **Section 2.1.1.2, Page 2-8.** According to the table of contents, Section 2.1.1.2 presents the potential receptors and exposure points for OU2. The first part of this section is jumbled and clearly missing some text. Section 2.1.1.2 should be revised to include all relevant text as provided by SulTRAC.

The revised HHRA will include the text that was incidentally omitted during production.

6. **Section 2.1.2, Page 2-10, Paragraph 1.** This section title is presented in standard font but should be revised to bold font consistent with other section titles.

The font will be corrected with the text.

7. **Section 2.1.2.1, Page 2-12, Paragraph 1.** With regard to vapor intrusion modeling, the text includes the citation “CalEPA (2005).” However, in Section 6.0, this reference is presented as “DTSC 2005.” Section 2.1.2.1 should be revised to cite the reference as “DTSC (2005).”

The reference will be corrected within the text.

8. **Section 2.1.2.2, Page 2-13, 4th and 5th bullets.** Add direct contact to surface water to trespasser and recreational scenarios.

Section 2.1.2.2 will be revised to add incidental ingestion of and direct contact with surface water to the list of exposure routes evaluated for the trespasser and recreationalist receptors. These additional exposure routes are already evaluated quantitatively in the HHRA report. However, mention of these additional exposure routes was accidentally omitted from Section 2.1.2.2.

9. **Section 2.2.1.2, Page 2-15, Paragraph 3.** The text states, “At each well, the most recent result for a given parameter was selected as the representative concentration.” This approach may not necessarily be health-protective. For example, groundwater concentrations at the Matthiessen and Hegeler Zinc Company Site have shown some seasonal variation. Therefore, the most recent result

may represent a lower concentration than measured during a previous sampling event. For OU1, representative groundwater concentrations should be selected as the maximum concentration based on at least the last four quarters of sampling results and at most the last 2 years of sampling results. This approach will help ensure that seasonal variation is taken into consideration. The text in Section 2.2.1.2 should be revised to reflect this new approach, and the text, tables, and figures throughout Appendix RA and Sections 7 through 9 of the RI report should be revised as needed to reflect this new approach.

Groundwater screening at OU1 was conducted on an OU-wide basis using all available groundwater data, including historical results. For the risk characterization, groundwater was evaluated on an exposure area basis (i.e., Carus Plant groundwater and Slag Pile groundwater). The most recent groundwater analytical results for each COPC were selected as being representative concentrations in each well; in some instances, the most recent sampling event varied by COPC within a single well. Within each exposure area, the maximum detected 'representative' concentration was selected as the EPC; thus, the EPCs are not representative of a single well. Attachment 1 presents all reported groundwater data for the Carus Plant (Table 1) and Slag Pile (Table 2), and identifies the representative COPC concentrations at each well (shown in bold text), and the selected EPC (highlighted yellow). Analytical results not considered in EPC selection (due to the use of more recent data) are shaded gray with faded text.

Barring any changes to the groundwater datasets, the OU1 HHRA calculated unacceptable risks from potable groundwater use. Importantly, there are no groundwater supply wells at OU1 and groundwater is not used for potable or industrial uses, including irrigation. An ordinance of the City of LaSalle in conjunction with a MOU between the City and IEPA legally prohibits the drilling of water wells at OU1 for the purposes of obtaining a water supply. Thus, the evaluation of potable groundwater use at OU1 was hypothetical and inherently subject to uncertainty regardless of the EPC selection approach. The selected groundwater remedy will likely include a formal institutional control prohibiting potable use of groundwater. Likewise, institutional controls will likely be implemented to require notice of contamination and measures to reduce utility and construction worker groundwater exposure at the Site. Thus, although the data selection process may have under- or over-estimated risks, the magnitude of difference between sampling events is unlikely to have biased the results such that the HHRA would show unacceptable risk where, in fact, there is none, or vice versa.

The EPC process is evaluated below for each exposure area; based on this evaluation and in response to this comment, no change is proposed to the Carus Plant groundwater dataset, but the Slag Pile groundwater dataset will be revised to include alternate (more conservative) EPCs.

Carus Plant Groundwater Uncertainty

At the Carus Plant (Table 1), the majority of groundwater wells were sampled in the early 1990s and again in 2007. Where available, the 2007 analytical result was selected as the representative concentration. Although a given well was sampled in 2007, specific parameters may have been excluded from analysis based on previous analytic results (e.g., cyanide and several VOCs were not included as target analytes in 2007 because they were not detected in the 1990s); in this case, the most recent analytical result was conservatively selected as the representative concentration. Although more recent data was given preference, three wells at the Carus Plant (G-05, MW-1, and P-6) were not sampled in 2007 due to low groundwater yield. Rather than exclude these wells, it was assumed that wells may be productive under future conditions, and, that although there was not sufficient groundwater to yield a viable sample, there may be groundwater present at the water table with which construction and utility workers could potentially have contact. The inclusion of the wells which were not productive in 2007 likely represents the greatest uncertainty in the risk characterization of groundwater at the Carus Plant; these uncertainties are described below.

- **G-05:** As indicated in Table 1, concentrations of aluminum, barium, copper, iron, lead, and mercury at G-05 are the maximum detected concentrations at the Carus Plant and, thus, were selected as the EPCs for the HHRA. Importantly, maximum detected concentrations of aluminum, barium, copper, and lead in 2007 were approximately 15 to 40% lower than those detected at G-05 in 1993. No wells sampled in 2007 had concentrations of lead above the MCL of 15 µg/L, whereas lead was detected at 2,180 µg/L at G-05 in 1993. Finally, mercury, which was a primary risk driver for construction and utility workers due to the inhalation of (assumed elemental) mercury vapors in trench air, was not detected in 2007. Thus, risks to Carus Plant receptors may have been overestimated due to the inclusion of data collected from G-05 collected in 1993.
- **MW-1:** MW-1 was sampled in 1992, 1993, and 1994. The target analyte list was modified through these sampling events based on the results of the previous event. Although results from 1994 were given preference, in several cases 1993 data represented the most recent result for a given parameter. The EPCs for arsenic and vanadium were based on the results from MW-1. The arsenic concentration detected in 1993 was approximately 3-times that

detected in 2007. Thus, the risk to Carus Plant receptors may have been overestimated due to the inclusion of data from MW-1 collected in 1993 and 1994.

- P-6:** P-6 was sampled two consecutive days in 1994; however, because of the algorithm used to select the representative concentrations, only the results of the second day were considered. The results from the first day of sampling at P-6 were reviewed relative to the selected EPC at the Carus Plant to evaluate potential impacts to the risk assessment. All day 1 concentrations from well P-6 were below the groundwater EPCs, with the exception of manganese. Manganese concentrations at P-6 were 25,300 and 2,530 µg/L on days 1 and 2, respectively, whereas the manganese concentration used in the risk characterization was 19,600 µg/L. Thus, the potential risk from manganese may have been underestimated. However, given the age of the data, we believe the selected concentration (collected from P-7 in 2007) is more representative of current and future conditions. Additionally, the fact that the results on consecutive days at P-6 are exactly an order of magnitude different raises potential data quality issues that would only further increase the level of uncertainty associated with the manganese groundwater risk estimates.

Slag Pile Groundwater Uncertainty

Table 2 presents all available groundwater data collected at the Slag Pile. Similar to the Carus Plant, some wells were sampled in both the 1990s and between 2007 and 2009 (MW-2, P-17, and P-18), some only in the 1990s (P-1, P-15, and P-19), and others only between 2007 and 2009 (ISW-001, ISW-002, MW-303H, MW-305H, MW-321H, and MW-322H). At the Slag Pile all maximum detected concentrations (i.e., EPCs) were from recent sampling events (19 and 20 August 2009) and collected from only two wells – ISW-001 and ISW-002. As noted in the comment, the algorithm utilized to select representative concentrations at these wells did not consider the “recent, but older” data at these wells, including the data collected two months early on 19 June 2009. June and August 2009 groundwater data were compared to evaluate the potential effect on the groundwater risk characterization. Instances where the June data exceeded the August data and, thus, would have affected the EPC are shown in red font in Table 2, and summarized in the table below.

| COPC | HHRA EPC (µg/L) | Alternate EPC (µg/L) | Relative Percent Difference |
|-------------|----------------------------|---------------------------------|--|
| Cobalt | 89.8 | 123 | 31% |
| Mercury | 0.42 | 0.47 | 11% |

Based on this evaluation, the risk estimates for these two constituents may have been underestimated

for groundwater exposure at the Slag Pile. However, given the fluid nature of groundwater, any point-risk may or may not be representative of exposures over time. Although the inclusion of this data will not change the conclusions of the Slag Pile groundwater risk characterization, the risk assessment will be revised to include the “Alternate EPC” values presented in the table above.

10. **Section 2.2.1.3; Sediment, Surface Water, and Fish Tissue; Page 2-16:** It is Illinois EPA’s opinion that basing the estimate of human risk from consumption of contaminated fish on only **two** fillets is inappropriate. As part of the Illinois Fish Monitoring program, IEPA would typically collect three trophic levels of fish with each composite comprised of five individual fish. The Illinois Fish Contaminant Monitoring program procedures call for the collection of two sizes of carp, one size of catfish, and one predator (e.g. largemouth bass). Please comment accordingly.

This comment is acknowledged. The community assessment work plan proposed collecting three sportfish (each) from two community reaches adjacent to the Site (CAR001 and CAR003) and the reference location (CAR004), for a planned total of nine samples. However, due to scarcity of target-sized individuals at all community reaches, including the reference reach, the target species and number of samples at each reach were modified in the field based on availability. As noted in this comment, two fish of sufficient size were able to be filleted and utilized in the HHRA. While the limited sample size is a source of uncertainty, the use of the maximum detected fillet concentration reduces the likelihood of underestimating risk. A discussion of the uncertainty associated with the fish tissue data set will be included in the revised risk assessment; however, no other changes are proposed in response to this comment.

11. **Section 2.2.1.3, Page 2-16, Paragraph 2, Bullet 1.** Bullet 1 presents the sediment data set. Item ii in this bullet refers to “two samples collected by Geosyntec in 1994.” However, no reference citation is provided for this statement. The text in Section 2.2.1.3 (and elsewhere in the risk assessment) should be revised as needed to provide a citation for the source of the “two [sediment] samples collected by Geosyntec in 1994.”

The text will be revised to include an appropriate citation and reference.

12. **Section 2.2.4.2, Page 2-23, Paragraph 2.** The last sentence in this paragraph ends with the phrase “. . . and the OU-specific results of background comparisons are presented in Appendix RA-2.” This statement is not entirely accurate. Appendix RA-2 includes only the results of background comparisons for OU2. The text should be revised to clarify that background comparisons for OU1

are not presented in Appendix RA-2 and to state where the OU1 background comparisons are presented.

The text will be revised to clarify the content of Appendix RA-2.

13. **Section 2.2.4.3; Evaluation of Infrequently Detected Constituents; Page 2-23:** Contaminants cannot be eliminated as COPCs based upon detection frequency without first comparing the concentrations to construction worker screening levels and evaluating the potential for the presence of a hot spot. Please provide this information.

The screening process will be modified such that constituents exceeding construction worker screening levels are retained as COPCs regardless of their detection frequency. The text will be revised accordingly. It is important to note, however, that no detected constituents were eliminated as COPCs on the basis of infrequent detection; therefore, this modification of the screening process will not affect COPC selection or the outcome of the HHRA.

14. **Section 2.2.5.1, Page 2-24, Paragraph 3.** All medium-specific COPCs are introduced except the COPCs for fish tissue. The text should be revised to include an introduction for the fish tissue COPCs.

The text will be revised to include an introduction for the fish tissue COPCs.

15. **Section 2.3.1.3.2, Page 2-32, Paragraph 2.** This paragraph contains numerous errors. First, Carus Plant shallow groundwater exposure point concentrations (EPC) are presented in Table G3.1.4 and not Table G3.1.2. Second, Carus Plant shallow and deep groundwater EPCs are presented in Table G3.1.3 and not Table G3.1.4. Third, Slag Pile shallow groundwater EPCs are presented in Table G3.2.4 and not Table G3.2.3. Fourth, Slag Pile shallow and deep groundwater EPCs are presented in Table G3.2.3 and not Table G3.2.4. The text should be revised as needed to refer to the correct table numbers.

The text will be revised to refer to the correct table numbers.

16. **Section 2.3.2.1.1, Page 2-34, Paragraph 1.** The text states, “After employing the first tier [a default RBA of 1.0] a[t] OU1, a literature-derived arsenic bioavailability factor of 14% was developed from the primate studies of mining and smelting soils (Roberts et al. 2007).” Based on a calculation check of the OU1 exposure calculations, it appears that all numerical incidental ingestion of soil results for arsenic are based on the use of a relative bioavailability (RBA) value of 14 percent. As described in

the Consensus Document (Appendix RA-1), calculations should first be performed using a default RBA value of 1.0. Then, if results are significant, site- and medium-specific RBAs can be used in follow-up calculations. The quoted text suggests that the first-tier use of a default RBA of 1.0 was conducted. However, the text does not indicate the location of these initial calculations in Appendix RA. The text should be revised to indicate where these calculations are presented.

Also, it appears that the RBA value of 14 percent has been applied to all soil and sediment calculations at the Carus Plant, Slag Pile, and LVR exposure areas. However, the studies upon which the selected RBA value are based apply to soils at smelting sites and apply most directly to soil from the Slag Pile. However, the characteristics of soil at the Carus Plant and sediment at the LVR may be different from soil at the Slag Pile. Therefore, the RBA value of 14 percent should not be applied to soil at the Carus Plant or sediment from the LVR unless it can be demonstrated that the characteristics of the soil and sediment at the Carus Plant and the LVR are sufficiently similar to soil at the Slag Pile and to the soils at smelting sites upon which the selected RBA value is based. If this demonstration cannot be made, the soil and sediment calculations at the Carus Plant and the LVR should be based on the default RBA value of 100 percent (1.0).

Finally, Section 2.3.2.1.1 should be revised to include a tie-in to the discussion of the range of RBA values (6.3 to 42 percent) calculated for OU2 (see Section 2.6.3.3). Based on this range, the use of a RBA value of 14 percent may underestimate exposures even for soils associated with smelting operations.

Subsequent discussions among some or all of USEPA, IEPA, SulTRAC and Geosyntec modified the nature of this comment and the proposed resolution. The proposed resolution is still under consideration and a more detailed response to this comment will be submitted on or before September 3, 2010.

Supplemental Response: The initial comment made essentially three points: (1) that initial human health risk assessment (HHRA) calculations should be made with a relative bioavailability (RBA) factor for arsenic of 100%; (2) that use of an alternative arsenic RBA of 14% might not be justified for Carus Plant Area soils and LVR sediments; and (3) the discussion of alternative arsenic RBA factors for OU1 should reference the range of RBA values calculated for OU2.

As to the third point, the discussion of alternate arsenic RBAs in the OU1 section will be revised to make reference to the range of RBA values calculated for OU2.

As to the first two points, in subsequent discussions several different RBA values were proposed for use at the Site or different exposure areas of the Site, including (in order from highest to lowest):

- 100%, which does not account for any chemical- or site-specific bioavailability;
- 80%, which is reported to have precedent for use at other Illinois or EPA-Region 5 sites;
- 25%, which represents the highest reported RBA from a primate study conducted with various types of soils (Roberts, et.al. 2002 cited in the Draft HHRA); and
- 14%, which represents the average RBA from a primate study conducted with mining and smelting soils (Roberts, et.al. 2007, also cited in the Draft HHRA).

While the Consensus Document proposed use of 100% as the Tier I RBA, presentation of HHRA results for both an arsenic RBA of 100% and 80% for every risk scenario across OU1 and OU2 will involve a significant amount of work for no material benefit in decision-making. The differences in risk assessment results based on the two RBAs are unlikely to result in any materially different conclusions, and presenting all the HHRA results with both RBAs is likely to be confusing. Based on subsequent discussions, we understand that EPA agrees that an arsenic RBA of 80% should be used as the Tier I arsenic RBA for use in the HHRA.

The initial comment from EPA agreed that 14% was an appropriate arsenic-RBA for the Slag Pile Area based on the references cited in the Draft HHRA. For the reasons set forth in the Draft HHRA and summarized in the paragraph below, we believe that the arsenic RBA of 14% is fully supported for use in the Slag Pile Area. Therefore, 80% will be used as the Tier I arsenic RBA in the RAGS Part D Tables for all other risk scenarios at OU1 and OU2, but 14% will be used as the Tier I arsenic RBA for the Slag Pile Area. RAGS Part D Tables using an arsenic RBA of 80% for the Slag Pile Area will be provided in the uncertainty section, and the impacts to the risk characterization will be evaluated through a comparison of the results.

We do not believe the arsenic RBA factor of 80% is based on appropriate scientific support and has limited site-specific relevance, whereas the use of a lower RBA for arsenic across the Site is supported by the literature and site-specific information. As described in the Draft HHRA, primate studies conducted by Roberts, et.al. (2002) utilizing a variety of soil types determined that an oral bioavailability factor of 25% is "the upper bound value to represent soil arsenic bioavailability." Subsequent studies specific to smelter and mining soils showed bioavailability results ranging from 5 to 19% with an average RBA of 14% (Roberts, et.al. 2007). Given that primate study results using the smelter soil most closely related to the site soils showed lowest bioavailability (5%) and the

sequential extraction results detailed in the RI report show that arsenic is tightly bound to Site soils, use of a 14% RBA for arsenic should represent a conservative assumption in the risk assessment. The RBA of 14% is also within the range of site-specific bioaccessibility studies performed with OU2 soils. Thus, the use of an 80% arsenic RBA likely overestimates risks for the Site, and in particular, at the Slag Pile Area would result in an inaccurate portrayal of risks.

17. **Section 2.3.2.4, Page 2.45, Paragraph 1.** The text states that chemical speciation data was not collected from fish tissue samples collected from the LVR to assess the form of arsenic. However, the text goes on to discuss how the fraction of arsenic likely is present in the organic chemical arsenobetaine and that the fraction of inorganic arsenic (the form upon which the toxicity factors used in the risk assessment are based) is expected to be 27 percent or less. Section 2.6.2.6.1 states that a value of 10 percent was selected as the percentage of inorganic arsenic in the fish fillet data. The text should be revised to clarify that the exposure calculations presented in the OU1 Risk Assessment Guidance for Superfund (RAGS) Table 7s (Appendix RA-G1) were initially performed assuming 100 percent inorganic arsenic. Any alternate percentage should be presented consistently throughout the risk assessment (Sections 2.3.2.4 and 2.6.2.6.1 should be consistent) and any additional calculations based on this alternate percentage should be presented as part of the uncertainty discussion, unless and until site-specific arsenic speciation results are available.

Subsequent discussions among some or all of USEPA, IEPA, SulTRAC and Geosyntec modified the nature of this comment and the proposed resolution. The proposed resolution is still under consideration and a more detailed response to this comment will be submitted on or before September 3, 2010.

Supplemental Response: As discussed at the 19 August 2010 meeting between Geosyntec, SulTRAC, EPA, Illinois EPA and Illinois DNR, the percentage inorganic arsenic assumed in fish is derived from an EPA Technical Report (*Technical Summary of Information Available on the Bioaccumulation of Arsenic in Aquatic Organisms, Office of Water, EPA-822-R-03-032, Dec. 2003*). Based on the follow-up discussions with EPA, we have included the 10% inorganic arsenic percentage in fish in the RAGS-D Tables and will include in the uncertainty analysis a discussion of the impacts of this assumption on risk.

18. **Section 2.3.3.5.2, Page 2-56, Paragraph 0, Bullet 5.** This bullet states that an exposure duration (ED) of 25 years is the default RME value. This statement is incorrect – the correct value is 30 years

(see the Consensus Document – Appendix RA-1 to the risk assessment). The text should be revised accordingly.

This was an error in the text only, and it will be revised accordingly. The correct ED value of 30 years was utilized in the reasonable maximum exposure (RME) risk characterization for current/future adult trespassers.

19. **Section 2.3.3.6.3, Page 2-65, Paragraph 0, Bullet 1.** This bullet states that an ED of 25 years is the default RME value. This statement is incorrect – the correct value is 30 years (see the Consensus Document – Appendix RA-1 to the risk assessment). The text should be revised accordingly.

This was an error in the text only, and it will be revised accordingly. The correct ED value of 30 years was utilized in RME risk characterization for future adult recreationalists.

20. **Section 2.3.3.7.1, Page 2-67, Paragraph 0, Bullet 6.** This bullet states that residents are assumed to be on site continuously. Therefore, an exposure time (ET) of 24 hours was used. However, in evaluating potential exposure to constituents in outdoor air under CTE conditions, an ET value of 3 hours was assumed (see the Consensus Document – Appendix RA-1 and Tables G4.10a.CTE and S4.9a.CTE in Appendix RA-G1). The text should be revised accordingly.

This was an error in the text only, and it will be revised accordingly. The correct ET value of 3 hours was utilized in the central tendency exposure (CTE) risk characterization for hypothetical future residents exposed to outdoor air.

21. **Section 2.3.3.7.2, Page 2-72, Paragraph 0, Bullet 3.** This bullet states that an ET value of 2 hours per day was used under both RME and CTE conditions and only as part of the chronic daily exposure (CDE) equation for inhalation. The statement is correct in that the term ET is used only in the CDE equation for inhalation. However, as presented in Tables G4.11a.RME, G4.11a.CTE, S4.10a .RME, and S4.10a.CTE, ET values of 24 hours per day and 3 hours per day were used under RME and CTE conditions, respectively. The text should be revised accordingly.

This was an error in the text only, and it will be revised accordingly. The correct RME and CTE ET values of 24 and 3 hours, respectively, were utilized in the risk characterization for hypothetical future residents exposed to outdoor air.

22. **Section 2.3.3.7.2, Pages 2-74 and 2-75.** The text on Pages 2-74 and 2-75 present the equations and assumptions used to calculate the following parameters:

- Age-adjusted dermal contact factor for inorganics (DFGWadj)
- Mutagenic DFGWadj (DFGW[M]adj)
- Age-adjusted dermal contact factor for organics – GW ($ET \leq t^*$) (DFGWadjo1)
- Mutagenic DFGWadjo1 (DFGW[M]adjo1)
- Age-adjusted dermal contact factor for organics – GW ($ET > t^*$) (DFGWadjo2)
- Mutagenic DFGWadjo2 (DFGW[M]adjo2)

The values presented for each of these parameters under RME conditions are correct. However, the values presented for each of these parameters under CTE conditions are incorrect. The correct CTE values for each of these values are presented below. All values have units of square-centimeters-hour-year per kilogram-event ($\text{cm}^2\text{-hr-yr/kg-event}$).

| | | |
|----------------|---|-------|
| • DFGWadj | = | 1,064 |
| • DFGW[M]adj | = | 5,225 |
| • DFGWadjo1 | = | 1,891 |
| • DFGW[M]adjo1 | = | 9,183 |
| • DFGWadjo2 | = | 1,064 |
| • DFGW[M]adjo2 | = | 5,225 |

The text and associated tables should be revised to present these values.

This was an error in the text only, and it will be revised accordingly. (Note: these text errors also occur in Table G411b.CTE. Also see the response to Appendix RA-G1 Specific Comment #9.) The correct CTE dermal contact factor values were utilized in the risk characterization for hypothetical future residents exposed to groundwater.

23. **Section 2.3.3.7.5, Pages 2-78 and 2-79.** Section 2.3.3.7.5 presents the adult angle exposure factors. The descriptions of values selected for some of these parameters (for example, the sediment ingestion rate [IRSED]) do not include reference citations when the selected values are based on guidance and not on professional judgment. The text should be revised as needed to include all applicable reference citations.

The text will be revised to include the appropriate references.

24. **Section 2.3.3.7.5, Page 2-79, Paragraph 0, Bullet 4.** This bullet states that an ED of 25 years is the default RME value. This statement is incorrect – the correct value is 30 years (see the Consensus Document – Appendix RA-1 to the risk assessment). The text should be revised accordingly.

This was an error in the text only, and it will be revised accordingly. The correct ED value of 30 years was utilized in RME risk characterization for current/future adult anglers who fish along the LVR.

25. **Section 2.3.3.8.2, Page 2-81.** Second equation missing “x3”

This was an error in the text only, and it will be revised accordingly. No mutagenic compounds were detected in fish; thus, this equation was not used in the risk characterization.

26. **Section 2.3.3.8.3, Page 2-82, Paragraph 0, Bullet 5.** This bullet states that an ED of 25 years is the default RME value. This statement is incorrect – the correct value is 30 years (see the Consensus Document – Appendix RA-1 to the risk assessment). The text should be revised accordingly.

This was an error in the text only, and it will be revised accordingly. The correct ED value of 30 years was utilized in the RME risk characterization for current/future adults who consume fish from the LVR.

27. **Section 2.5.2.1.2, Page 2-96, Paragraph 2.** The text presents risks and hazards for future commercial/industrial workers at the Carus Plant. The text states that if ingestion of groundwater were eliminated (for example, if the pathway remains incomplete), “no unacceptable RME non-cancer risks would be identified” for this receptor under the RME scenario. Although it is true that no COPC-specific hazards exceed 1, the total hazard for potential exposure to subsurface soil is 1.2 and exceeds 1. The text should be revised to identify this hazard.

The text will be revised to acknowledge this multiple-chemical hazard index (HI).

28. **Section 2.5.1.3; Risk Evaluation for Lead; Page 2-91:** For adult utility workers and adult construction workers, the maximum concentration (not average concentration) of lead shall be used as the exposure point concentration.

The maximum detected concentration will be used as the EPC for adult utility and construction workers as requested, and the text and tables revised accordingly.

29. **Section 2.5.2.1.3; Current and Future Utility Worker; Page 2-97:** The maximum site concentration shall be compared to the utility worker PRG for lead.

The maximum detected concentration will be used as the EPC for adult utility workers as requested, and the text and tables revised accordingly.

30. **Section 2.5.2.1.4, Page 2-99, Paragraph 3.** The text states that the cumulative HI is 51 under the RME scenario. The text also should be revised to state that this cumulative HI is based on total HIs of 20 and 31 for subsurface soil and groundwater, respectively.

The text will be revised to include a discussion of the medium-specific HIs as requested. Also see response to Section 2.0, General Comment No. 1.

31. **Section 2.5.2.1.4; Future Construction Workers; Page 2-99:** The maximum site concentration shall be compared to the construction worker PRG for lead.

The maximum detected concentration will be used as the EPC for adult construction workers as requested, and the text and tables revised accordingly.

32. **Section 2.5.2.1.4, Page 2-100, Paragraph 2.** The text states that the cumulative HI is 38 under the CTE scenario. The text also should be revised to state that this cumulative HI is based on total HIs of 7.1 and 31 for subsurface soil and groundwater, respectively.

The text will be revised to include a discussion of the medium-specific HIs as requested. Also see response to Section 2.0, General Comment No. 1.

33. **Section 2.5.2.1.5, Page 2-101, Paragraphs 3 through 6.** The text states that the cumulative RME HIs, including surface soil and subsurface soil, are 8,600 and 8,500, respectively. The text should be revised to specify the surface soil and subsurface soil total HIs of 132 and 56, respectively.

Similarly, the text states that the cumulative CTE HIs, including surface soil and subsurface soil, are 2,900 and 2,900, respectively. The text should be revised to specify the surface soil and subsurface soil total HIs of 62 and 27, respectively.

The text will be revised to include a discussion of the medium-specific HIs as requested. Also see response to Section 2.0, General Comment No. 1.

34. **Section 2.5.2.1.5, Page 2-102, Paragraphs 2 through 5.** These paragraphs present the carcinogenic risks for the aggregate resident under both RME and CTE conditions. However, the text focuses on a discussion of total carcinogenic risks. The text should be revised to also provide medium-specific total carcinogenic risks greater than 1E-06 for all media. Also, for each identified medium-specific total risk, the text should identify the COPCs associated with cancer risks greater than or equal to 1E-06.

The text will be revised to include a discussion of the medium-specific carcinogenic risks as requested. Also see response to Section 2.0, General Comment No. 1.

35. **Section 2.5.2.2.1, Pages 2-108 and 2-109, Paragraphs 3 through 5 and 0 through 1.** The text presents cumulative cancer risks and HIs under RME and CTE conditions. However, the text does not provide sufficient detail (compared to the preceding RME discussion). The text should be revised to provide medium-specific total risks and hazards and also should identify COPC-specific risks and hazards that are greater than or equal to 1E-06 and greater than 1, respectively.

The text will be revised to include a discussion of the medium-specific carcinogenic risks and HIs as requested. Also see response to Section 2.0, General Comment No. 1.

36. **Section 2.5.2.2.3; Current and Future Utility Worker; Page 2-112:** The maximum site concentration shall be compared to the utility worker PRG for lead.

The maximum detected concentration will be used as the EPC for adult utility workers as requested, and the text and tables revised accordingly.

37. **Section 2.5.2.2.4; Future Construction Workers; Page 2-113:** The maximum site concentration shall be compared to the construction worker PRG for lead.

The maximum detected concentration will be used as the EPC for adult construction workers as requested, and the text and tables revised accordingly.

38. **Section 2.5.2.2.4, Pages 2-113 and 2-114, Paragraphs 3 through 5 and 1 through 3.** The text presents cumulative cancer risks and HIs under RME and CTE conditions. However, the text does not provide sufficient detail (compared to the preceding RME discussion). The text should be revised to provide medium-specific total risks and hazards and also should identify COPC-specific risks and hazards that are greater than or equal to 1E-06 and greater than 1, respectively.

The text will be revised to include a discussion of the medium-specific carcinogenic risks and HIs as requested. Also see response to Section 2.0, General Comment No. 1.

39. **Section 2.5.2.4; Localized Impact Evaluation; Page 2-127:** Section 2.5.2.4 provided a brief discussion of areas where contaminant concentrations exceeded construction worker screening levels. It is stated on Page 2-127, that “. . . this comparison is not intended to guide risk management decisions.” Illinois EPA does not agree with this statement. Construction workers are an important receptor group and the estimated risk to these workers should definitely have impact on risk management decisions.

The above-referenced statement was not intended to suggest that construction workers are not an important receptor group; this point is illustrated throughout the risk assessment by the inclusion of construction worker-based screening levels in the general screening process and the quantitative evaluation of construction workers at the Slag Pile (where significant construction is unlikely due to its uncertain load-bearing capacity) and at the Carus Plant. Rather, the above-referenced statement is intended to convey that screening levels are not remediation levels. The text will be further clarified.

40. **Section 2.5.3.1.7, Page 2-153, top bullet.** Replace “(and only if worker exposure is limited to surface soil)” with “from exposure to surface soil”.

Section 2.5.3.1.7 will be revised to replace the phrase “(and only if worker exposure is limited to surface soil)” with the phrase “from exposure to surface soil.”

41. **Page 2-160, 2-162, 2-231, 2-247, 2-248, 2-249.** Lack of consistency when comparing lead levels to screening levels. It is recommended that average lead concentrations (EPCs) be compared to screening levels to determine potential risk throughout the report.

As discussed during several conference calls, the HHRA report will be revised to ensure that for utility and construction workers, maximum lead concentrations in soil are compared to screening levels. For all other receptors, average lead concentrations will be compared to screening levels.

42. **Section 2.5.3.6.3; Current/Future Resident; Page 2-249:** Illinois EPA wants to ensure that the assessment of risk for current residents was based upon data from individual residential lots. Concentrations cannot be averaged over the entire residential area sampled.

In the draft risk assessment, exposures, risks, and hazards were calculated over the entire off-site residential area (EA6) using analytical data from samples collected at individual residential lots. This

approach will be revised, and exposures, risks, and hazards will be calculated for individual residential lots. In order to focus the discussion of the lot-specific risk and hazard results, the risk assessment will be revised to discuss COPCs and exposure pathways associated with risks greater than 1E-06 and hazards greater than 1 for EA6 as a whole.

43. **Section 2.6.3.1; Use of Maximum Concentrations for Utility and Construction Worker**

Calculations; Page 2-273: Illinois EPA takes exception with the use of the term “uber-sample” to describe the contaminant concentrations used to evaluate the utility and construction worker receptors. In the absence of samples collected from an area the size of a trench, no averaging for the construction worker or utility worker is allowed and the use of the maximum concentration is appropriate and should not be considered “extreme or excessive” as is implied by the term “uber-sample.”

Section 2.6.3.1 will be revised to replace the term “uber-sample” with the term “artificial composite sample.” It is acknowledged that use of maximum concentrations is appropriate for construction and utility workers because they may be exposed over only a portion of any exposure area. Therefore, averaging is unacceptable. However, it should be noted that the maximum concentrations of various chemicals are not all co-located. In fact, the maximum concentrations of different chemicals may be located at significant distances from each other. Therefore, the combination of maximum concentrations of chemicals for a given exposure area into concentrations in a single artificial composite sample introduces an additional level of conservatism.

Section 2.6.3.1 of the RA report discusses uncertainties associated with using maximum concentrations to evaluate potential utility worker and construction worker exposures, including the combination of maximum concentrations from disparate locations within an exposure area.

44. **Section 2.7.1; OU1 HHRA Summary and Conclusions:** Please revise text in Section 2.7.1 in order to compare maximum concentrations of lead to the utility worker and construction worker receptors.

The maximum detected concentration will be used as the EPC for adult construction workers as requested, and the text (including summary and conclusion text) and tables revised accordingly.

APPENDIX RA SECTION 3.0 SPECIFIC COMMENTS

1. **Section 3.1.1.1.3, Page 3-5, Paragraph 1.** This paragraph describes the floodplain within the LVR and notes that 31.5 acres of the Matthiessen and Hegeler Zinc Company Site are within the 100-year

floodplain. The area identified as floodplain should be included in a figure, and the text should refer to that figure.

A figure that identifies the 100-year floodplain will be provided, and an appropriate reference to that figure will be made within the text.

2. **Section 3.1.1.1.3, Page 3-6, Paragraph 1.** The last sentence in this paragraph states that monitoring of the macroinvertebrate community conducted by the Illinois Environmental Protection Agency (IEPA) at the southern boundary of OU1 indicated a generally abundant and diverse community. No reference citation is provided for this statement. Either the text should provide a reference citation and a reference, or the statement should be removed.

The source of this information is:

LaSalle County Soil and Water Conservation District. 2003. *“A Watershed Strategy for the Little Vermillion River Watershed, LaSalle County, Illinois”*. Volume I, LaSalle County Soil and Water Conservation District; Ottawa, IL.

The MBI (not mIBI) score for IEPA Station DR-01 located at the Highway 6 bridge was reported as 54 based on data collected in October 1999; this score indicates “Full Support” of aquatic life uses. No fish IBI apparently exists for this station.

The report text will be revised accordingly to include the reference citation.

3. **Section 3.1.2.1.1, Page 3-11, Paragraph 1, and Figure RA-G3-2.** The text identifies the receptors observed at OU1 and notes that plants are receptors. However, plants are not included in the conceptual site model (CSM) depicted in Figure RA-G3-2. This receptor must be added to the CSM and identified as a complete exposure pathway. Also, Figure RA-G3-2 should be revised to define the acronyms “ASO” and “CSO” in the footnotes.

The SLERA CSM will be revised to include plants. The acronyms ASO (Abandoned Sewer Outfall) and CSO (Combined Sewer Overflow) will be defined in Figure RA-G3-2 as well.

4. **Section 3.2.2.1.2, Page 3-20, Paragraph 2, and Table RA-G3-3.1.** This paragraph contains the hazard quotient (HQ) results for the Slag Pile. The result for chromium is listed as 2.1. However, the information in Table RA-G3-3.1 lists an HQ for chromium of 1.9. The text and table should be revised as needed to resolve this discrepancy.

The correct HQ is 1.9. The text will be revised accordingly.

5. **Section 3.4.1, Page 3-38, Bullet 1.** This bullet provides the rationale for not conducting a BERA for the Slag Pile at OU1. The last statement states that the physical substrate creates a poor habitat for ecological receptors. Although the substrate is not ideal, large portions of the Slag Pile Area are vegetated and support a number of ecological receptors. In addition, these portions of the Slag Pile contain complete exposure pathways. Either the last sentence in this bullet should be deleted or else text should be added to note that although portions of the Slag Pile are poor habitat, other areas contain established vegetation and exposure of ecological receptors is occurring and will continue to occur in these areas.

The comment is acknowledged. The statement that the physical substrate, slag, presents a poor habitat is accurate and justified, and the bullet as written acknowledges that "limited vegetation and wildlife receptors have been observed." Those two statements could be coordinated differently and slightly expanded to provide a slightly different emphasis. The significant likelihood that large portions of the Slag Pile Area will be stripped of the existing vegetation as part of the regrading and slope protection measures which may be selected as remedial actions for the Site is a further justification for not conducting a BERA that was inadvertently omitted from the bullet. Revisions will be made to address this comment and to include reference to the likely impact of remedial measures on the existing habitat.

APPENDIX RA SECTION 4.0 GENERAL COMMENTS

1. The BERA for OU1 focuses on receptors in the LVR. In the evaluation of potential impacts to the macroinvertebrate and fish communities in the LVR, the BERA only evaluates results of the indices of biotic integrity (IBI) to assess the overall health of these communities. In order to fully evaluate the potential impacts, it is important that a full weight-off-evidence evaluation be made. For OU1, this evaluation should include an assessment of the chemical and physical conditions observed in LVR sediment and surface water samples. IEPA guidance for the interpretation of the IBI results (IEPA 2005) clearly states, “Successful interpretation and use of biological indicators requires corresponding information on the physical and chemical settings in which aquatic organisms live; in this way, biological measures, such as an Illinois fish-IBI score, complement rather than replace the utility of more-traditional physicochemical measures.” The inclusion of this type of information in the BERA will present a more complete picture of the potential and observed risks.

The BERA does not evaluate only the results of the IBIs for the fish and macroinvertebrate communities. That was an important part of the evaluation, in fact, the part that is most instructive as to whether or not the site has impacted ecological receptors. Nevertheless, a full weight-of-the evidence evaluation was performed in conducting the BERA. To the extent the text of the BERA does not reflect that evaluation, we will review it and include additional text reflecting the full weight-of-the evidence evaluation that was conducted. Additional information regarding the distribution of slag (as percent of sediment), IBI scores, and COPC concentrations and distributions will be presented to indicate the spatial relationship of chemical and physical conditions observed in the LVR.

APPENDIX RA SECTION 4.0 SPECIFIC COMMENTS

1. **Section 4.1.1.1, Page 4-4, Paragraph 1.** As noted in the Section 4.0 General Comments, General Comment No. 1, the BERA should include the physical and chemical conditions observed in LVR sediment and surface water samples as part of its weight-of-evidence evaluation of potential risks to the macroinvertebrates and fish communities.

This comment is acknowledged. Please see the Response to Appendix RA, Section 4.0, General Comment No. 1.

2. **Section 4.1.2.1, Page 4-6, Bullets 1 and 2.** As noted in the Section 4.0 General Comments, General Comment No. 1, the BERA should include the physical and chemical conditions observed in LVR

sediment and surface water samples as part of its weight-of-evidence evaluation of potential risks to the macroinvertebrates and fish communities.

This comment is acknowledged. Please see the Response to Appendix RA, Section 4.0, General Comment No. 1.

3. **Section 4.1.2.2.1, Page 4-7, Paragraph 3.** The text describes the study design for evaluating the macroinvertebrate and fish communities in the LVR. As noted in the Section 4.0 General Comments, General Comment No. 1, the BERA should include the physical and chemical conditions observed in LVR sediment and surface water samples as part of its weight-of-evidence evaluation of potential risks to the macroinvertebrates and fish communities. In addition, it is expected that more representative concentrations will be used in this evaluation than the maximum concentrations. Finally, the data should be presented to correspond to the sampling locations for both fish and macroinvertebrates. It is anticipated that the sediment data will also be presented for each macroinvertebrate sampling location for the east and west sides of the LVR.

This comment is acknowledged. Please see the Response to Appendix RA, Section 4.0, General Comment No. 1.

4. **Section 4.1.2.2.2, Page 4-9, Paragraph 1.** A reference citation and reference should be provided for the equation used to model the average daily dose.

A reference will be included in the revised text.

5. **Section 4.1.5.1, Page 4-17, Paragraph 4.** This section discusses the results of the macroinvertebrate IBI for each sampling station. The text should note that the lowest IBI scores were for locations next to the Slag Piles and that an impact was observed, even though the impact was not sufficient to lower the scores below the impairment threshold of 41.8.

The text will be revised to note that the lowest IBI scores were for locations next to the Slag Pile. By itself, this fact does not justify a conclusion that an impact was observed. Based on the full weight-of-evidence approach, no impact was observed that can be attributed to the Site.

Supplemental Response: A fuller discussion and analysis of the macroinvertebrate IBI (mIBI) values appears in Section 3.3.6 of the Biological Assessment of the Little Vermilion River (Appendix RA-G-2 OU1 to the Draft Risk Assessment). As noted in that appendix, CAR003 was located at the northern end of, and adjacent to, the Slag Pile (Section 2.1), and yet that reach had mIBI scores that

were virtually the same as those for the upstream reach, CAR004. More of the discussion from Section 3.3.6 of the Biological Assessment explaining the somewhat lower mIBI scores at reaches CAR001 and CAR002 will be summarized in Section 4.1.5.1 of the Risk Assessment to address this comment, however, the overall conclusion in Section 4.1.5.1 that "the function and viability of the benthic communities in the LVR adjacent to the Site have not been adversely affected," remains correct and supported by the full weight-of-the-evidence.

APPENDIX RA SECTION 5.0 GENERAL COMMENT

1. Section 5.0 should be revised as necessary to reflect all revisions made in response to the specific and general comments above on the preceding risk assessment sections.

Section 5.0 of Appendix RA will be revised as appropriate to incorporate any changes made to the risk assessments based on the comments and response provided herein.

APPENDIX RA SECTION 6.0 GENERAL COMMENT

1. Various references cited in text do not appear in the reference list in Section 6.0. Examples of missing references (and the pages they are cited on) include Buchet et al. 1994 on Page 2-45, EPA 1990 on Page 2-133, Tetra Tech 1996 on Page 2-45, USGS 1994 on Figure RA-1-1, USDA NAIP 2007 on Figure RA-1-2, and WHO 1991 on Page 2-272. These examples should not be assumed to reflect all missing references. The risk assessment should be thoroughly reviewed to ensure that all references cited in the text are included in Section 6.0 and vice versa.

The references section will be revised to include the missing references noted above. Additional review of citations and references will also be conducted during the revision process.

APPENDIX RA SECTION 6.0 SPECIFIC COMMENTS

1. **Section 6.0, Page 6-6.** References EPA 2009e through 2009h represent comment letters and memoranda prepared by EPA. However, all of these references lack important specific details, such as the author, organization, and subject of these documents. All four of these references should be revised to provide this important information.

Additional identifying information will be included in the references for EPA comment letters and memoranda.

2. **Section 6.0, Page 6-7.** The references for Geosyntec 2007 and 2009 represent Phase I and Phase II RI reports prepared for the Matthiessen and Hegeler Zinc Company Site. In order to aid readers in locating these documents, report dates should be added to both of these references.

Report dates will be included in the references for the Phase I and Phase II RI Reports.

APPENDIX RA-2 SPECIFIC COMMENT

1. **Table RA-2-1.** Table RA-2-1 presents summary statistics for background soil. The far right column of this table has been cut off. Table RA-2-1 should be revised so that all the information is presented in the table clearly and completely.

Table RA-2-1 will be revised so that all information (including the far right column) is presented clearly and completely.

APPENDIX RA-4 SPECIFIC COMMENT

1. **Appendix RA-4; Technical Approach to Calculating Preliminary Remediation Goals for Lead; Section 2.2.1; Adult Utility Workers; Page 3.** The utility worker assumption is that exposure is expected to occur infrequently (less than once a month resulting in a RME exposure frequency of 20 days per year). The guidance document for the adult lead model recommends that the model should not be applied to scenarios in which the exposure frequency is less than 1 day/week. The guidance further states that “Infrequent exposures (i.e., less than 1 day per week) over a minimum duration of 90 days would be expected to produce oscillations in blood lead concentrations associated with the absorption and subsequent clearance of lead from the blood between each exposure event.” It seems that the application of the adult lead model for the purpose of establishing utility worker PRGs for lead may be inappropriate. The assumption of steady state conditions must also apply to the adult site-specific worker and the trespasser receptors.

The adult lead model (ALM) was used to calculate receptor-specific PRGs for the adult utility workers, adult site-specific workers, and adolescent and adult trespassers. The ALM represents the most widely used and accepted model for evaluating potential exposure to lead for adolescent and adult receptors. It is acknowledged that the exposure frequencies for the identified receptors are less than once per week. It is also acknowledged that, as stated in the comment, this type of infrequent exposure “would be expected to produce oscillations in blood lead concentrations” and that steady-

state conditions may not be reached for these receptors. However, no readily available alternative models are designed to address this type of infrequent exposure. Therefore, the HHRA report will continue to use the ALM to calculate soil lead screening levels but will be revised to discuss the limitations of the use of the ALM under conditions of assumed infrequent exposure.

2. Appendix RA-4; Technical Approach to Calculating Preliminary Remediation Goals for Lead; Section 2.2.5.1; Child Recreationalist; Page 7.

The calculation of the soil PRG for lead for the child recreationalist assumes a fraction of time spent at home with a concentration of lead in the soil at the home being 38.1 mg/kg. Since the children most likely to be present at the site are those living in close proximity to the site, TAU suggests that the concentrations of lead in soil in the residential areas adjacent to the site which have been sampled as part of this investigation are more appropriate as inputs to the PRG calculation.

Appendix RA-4 presents the calculation of lead soil PRGs for the child recreationalist assuming a concentration of lead in the soil at home of 38.1 milligrams per kilogram (mg/kg). It is acknowledged that the children most likely to use the site for recreation are those who live near the site. Therefore, Appendix RA-4 will be revised to change the assumed concentration of lead in soil at home to equal the average concentration of lead in surface soil in the off-site exposure area (EA6) of 280 mg/kg (see Appendix RA-S1, Table S3.1.6). The revised soil lead PRGs for the child recreationalist are 865 and 1,480 mg/kg under reasonable maximum exposure (RME) and central tendency exposure (CTE) conditions, respectively. The HHRA report will be revised to present and evaluate the risks associated with potential exposure to lead in soil by child recreationalists using these revised soil lead PRGs.

APPENDIX RA-G1 GENERAL COMMENTS

1. The tables of raw data only provide averages for subsurface soil when multiple depths were sampled at an individual location. Averages are also reported for LVR surface water when multiple sampling events occurred at an individual location. This presentation approach precludes independent verification of selected summary statistics in the RAGS Tables 2s and 3s in Appendix RA-G1. Also, the footnotes do not indicate how averages were calculated when both detected and non-detect results are presented (or how qualifiers were assigned to the averages in these cases). Additionally, it is unclear whether the maximum detected concentrations were determined before or after the averages were calculated. Use of averages for selected locations introduces unknown bias to calculations of

the mean, standard deviation, and 95 percent upper confidence limit (95UCL). The footnotes for RAGS D Tables 2s and 3s should be revised as needed to address these issues and clearly explain how summary statistics were prepared. Also, a discussion of the decisions (and ramifications) of this approach should be provided as part of the uncertainty analysis.

The COPC data summary tables in Appendix RA-G3 will be revised to include the analytical results at each location and depth. Likewise, all analytical results will be provided for the ASO and CSO surface water sampling events. The footnotes in Appendices RA-G3 and RA-G1 (Tables 2s and 3s) will be revised appropriately to more clearly describe the methods for calculating summary statistics. The text will be revised to include a discussion of uncertainties associated with data handling, including the use of averages within the 95UCL calculation.

2. The footnotes in the RAGS Table 3s indicate that calculation of the mean for samples with detected and censored results used surrogate values equal to one-half the reporting limit (RL) for the censored data. Use of simple substitution is not recommended in these cases, and it is suggested that the Kaplan-Meier means from the ProUCL output are a more appropriate estimation method. The RAGS D Table 3s should be revised accordingly.

This comment is acknowledged. However, there is uncertainty associated with both methods for calculating the mean. Given the high frequency of detection for the majority of constituents (i.e., metals), the calculation method is unlikely to significantly affect the resultant mean value. Moreover, with the exception of the evaluation of lead, mean concentrations were not utilized in the risk assessment. Therefore, no changes are proposed in response to this comment.

3. The documentation for ProUCL indicates that one of the changes incorporated in the Version 4.00.04 update is reduced reliance on lognormal-based UCL methods. The recommendations or “decision rules” for method selection in Version 4.00.04 substitute the Chebyshev (Mean, Std) for the MVUE Chebyshev method in all situations where the MVUE method was previously recommended (see Table 9 of the Technical Guide). In a small number of cases in the RAGS D Table 3s, results for the MVUE Chebyshev method are used as the EPCs. Review of the ProUCL output indicates that this approach is recommended by the software. It is unclear whether this is an error in the software, but this outcome is contradicted by the discussion and recommendations in the User and Technical guides that accompany ProUCL 4.00.04. The RAGS D Table 3s (and associated exposure, risk, and hazard results) should be revised to report the result consistent with the recommendations in the User and Technical guides or additional justification and explanation for the approach used should be provided.

If the latter option is chosen, a discussion of the impact of using the result consistent with the User and Technical guides on the exposure, risk, and hazard results should be included as part of the OUI uncertainty discussion (see Section 2.6.2).

The response to this comment is still under consideration and an updated response will be provided on or before September 3, 2010.

Supplemental Response: UCL results used in the assessment were based on the recommended methods specified by the latest version of the ProUCL software. While the developers of ProUCL have expressed some reservation with the use of the lognormal distribution, this was based on the observation that the lognormal methods sometimes resulted in overly conservative estimates of the UCL. The lognormal distribution has a clear theoretical basis associated with the multiplicative process assumed with contaminant transport and dilution. The simulations used to develop the ProUCL algorithm (resulting in nominal 95% UCL coverage) included in the MVUE methodology (i.e., the appearance of MVUE methods in the UCL results is not a blatant error in the ProUCL code). Therefore, we consider the current version of the ProUCL software, used at practically all CERCLA sites, the most defensible and transparent approach.

4. Various tables refer to the location of chemical-specific RBAs as the “Table 5 Series.” However, no chemical-specific RBA values are included in the Table 5 Series. The tables should be revised as needed to clearly direct the reader to the location or source of the chemical-specific RBA values.

The tables will be revised to direct the reader to the location or source of the chemical-specific RBA values.

APPENDIX RA-G1 SPECIFIC COMMENTS

1. **Table G2.4.** The column header incorrectly identifies the human health screening levels (HHSL) as “Surface Water HHSL.” The column header should be revised to read “Groundwater HHSL.”

The Table G2.4 column header will be corrected.

2. **Table G4.4b.CTE.** The table lists the averaging time for noncarcinogens (ATnc) as 91 days. However, as noted in the text, the correct ATnc value is 41 days under the CTE scenario. The table (and associated calculation values) should be revised accordingly.

This was an error in the 4 Series Table only, and it will be revised accordingly. The correct CTE ATnc value of 42 days (6 weeks x 7 days per week) was utilized in the CTE risk characterization for future construction workers.

3. **Table G3.3.3.** Please correct footnotes by adding footnote “3” and correcting footnotes “4” and “5” and (2) please indicate whether “wet weight” was used for the calculation of exposure point concentrations for the anglers evaluated as part of the risk assessment.

The footnotes numbering will be corrected. Dry weight was used for the calculation of EPCs for anglers; a footnote will be added.

4. **Table G4.6a.CTE.** Under the inhalation exposure route, the exposure frequency (EF) is presented as 43 days per year. However, as noted in the text, the correct EF value is 21 days per year under the CTE scenario. The table should be revised accordingly.

This was an error in the 4 Series Table only, and it will be revised accordingly. The correct CTE EF value of 21 days (3 weeks x 7 days per week) was utilized in the CTE risk characterization for future construction workers.

5. **Table G4.10a.RME.** Under the ingestion of produce exposure route, the parameter ED is missing. As discussed in text, the correct ED value is 6 years under the RME scenario. The table should be revised accordingly.

This was an error in the 4 Series Table only, and it will be revised accordingly. The ED parameter (6 years) was included in the RME risk characterization for hypothetical future child residents who consume produce grown on-site.

6. **Table G4.10b.CTE.** Under the ingestion of groundwater exposure route, the conversion factor – water (CFdw) is incorrectly presented as 1.0E+03 milligram per microgram (mg/μg). The correct value is 1.0E-03 mg/μg. The table should be revised accordingly.

This was an error in the 4 Series Table only, and it will be revised accordingly. The correct CFgw of 1.0E-03 mg/μg was utilized in the CTE risk characterization.

7. **Tables G4.11a.RME and G4.11a.CTE.** The equation for the ingestion of produce exposure route incorrectly includes the term ED. As shown in the footnotes to the tables, the ED term has been

incorporated into the age-adjusted produce ingestion rates. Therefore, the equation should be revised to remove the ED term from the equation.

This was an error in the 4 Series Table only, and it will be revised accordingly. The ED parameter was correctly incorporated into the RME and CTE age-adjusted produce ingestion rates for hypothetical future aggregate residents who consume produce grown on-site.

8. **Table G4.11a.CTE.** The table (and all associated calculations and text) should be revised as needed to address the errors summarized below.

- The age-adjusted dermal contact factor – soil (DFSadj) is presented as 241 milligrams-year per kilogram-day (mg-year/kg-day). This value is incorrect. The correct value is 47.2 mg-year/kg-day according to Footnote 6. Note the comment on Footnote 6 presented below.
- The mutagenic DFSadj factor (DFSMadj) is presented as 1,246 mg-year/kg-day. This value is incorrect. The correct value is 246 mg-year/kg-day according to Footnote 7. Note the comment on Footnote 7 presented below.
- The ET factor is presented as 24 hours per day. The correct value as discussed in the text is 3 hours per day. Also, Footnote 11 should be revised to explain that this value is based on best professional judgment.
- The age-adjusted aboveground produce ingestion rate parameter (CRagadj) is presented as 3.59E-02 year-kilogram dry weight per kilogram-day (yr-kg DW/kg-day). This value is incorrect. The correct value as presented in the text is 1.64E-02 yr-kg DW/kg-day.
- The mutagenic CRagadj parameter (CRaga[M]adj) is presented as 1.14E-01 yr-kg DW/kg-day. This value is incorrect. The correct value as presented in the text is 8.1E-02 yr-kg DW/kg-day.
- The age-adjusted belowground produce ingestion rate parameter (CRbgadj) is presented as 4.74E-03 yr-kg DW/kg-day. This value is incorrect. The correct value as presented in the text is 1.83E-03 yr-kg DW/kg-day.
- The mutagenic CRbgadj parameter (CRbga[M]adj) is presented as 1.35E-02 yr-kg DW/kg-day. This value is incorrect. The correct value as presented in the text is 8.6E-03 yr-kg DW/kg-day.
- Footnote 6 begins with the term IRSadj. This term is incorrect. The correct parameter is DFSadj. Also, the soil-to-skin adherence factor (AF) used for the last third of the equation is 0.07 milligram per square centimeter (mg/cm²). This value also is incorrect. The correct value is 0.01 mg/cm² and corresponds to the EPA-recommended default adult CTE value.
- Footnote 7 begins with the term IRSadj. This term is incorrect. The correct parameter is DFSMadj. Also, AF value used for the last third of the equation is 0.07 mg/cm². This value is incorrect. The correct value is 0.01 mg/cm² and corresponds to the EPA-recommended default adult CTE value.

The above-listed errors were in the 4 Series Table only, and they will be revised accordingly. The correct age-adjusted values were utilized in the CTE risk characterization for hypothetical future aggregate residents.

9. **Table G4.11b.CTE.** The table (and all associated calculations and text) should be revised as needed to address the errors summarized below.

- The age-adjusted dermal contact factor for inorganics – GW (DFGWadj) is presented as 2,414 cm²-hr-yr/kg-event. This value is incorrect. The correct value is 1,064 cm²-hr-yr/kg-event according to Footnote 6.
- The mutagenic DFGWadj parameter (DFGW[M]adj) is presented as 7,475 cm²-hr-yr/kg-event. This value is incorrect. The correct value is 5,225 cm²-hr-yr/kg-event according to Footnote 7.
- The age-adjusted dermal contact factor for organics – GW (ET≤t*) parameter (DFGWadjo1) is presented as 4,602 cm²-hr-yr/kg-event. This value is incorrect. The correct value is 1,891 cm²-hr-yr/kg-event according to Footnote 8a.
- The mutagenic DFGWadjo1 parameter (DFGW[M]adjo1) is presented as 13,745 cm²-hr-yr/kg-event. This value is incorrect. The correct value is 9,183 cm²-hr-yr/kg-event according to Footnote 9a.
- The age-adjusted dermal contact factor for organics – GW (ET>t*) parameter (DFGWadjo2) is presented as 2,414 cm²-hr-yr/kg-event. This value is incorrect. The correct value is 1,064 cm²-hr-yr/kg-event according to Footnote 8b.
- The mutagenic DFGWadjo2 parameter (DFGW[M]adjo2) is presented as 7,475 cm²-hr-yr/kg-event. This value is incorrect. The correct value is 5,225 cm²-hr-yr/kg-event according to Footnote 9b.

The above-listed errors were in the 4 Series Table only, and they will be revised accordingly. The correct age-adjusted values were utilized in the CTE risk characterization for hypothetical future aggregate residents.

10. **Table G4.16.CTE.** The table incorrectly presents the ATnc value as 10,950 days. The correct value is 3,285 days. The table should be revised accordingly.

This was an error in the 4 Series Table only, and it will be revised accordingly. The correct ATnc value of 3,285 days was utilized in the CTE risk characterization for current/future adults who consume fish from the LVR.

APPENDIX RA-G3 GENERAL COMMENTS

1. Tables RA-G3-1.3 and RA-G3-2.3 are not listed in the table of contents list of Tables for this appendix. Also, Table RA-G3-4 is listed in the table of contents but is not included in Appendix RA-G3. Appendix RA-G3 should be revised to ensure that the table of contents list of Tables matches the tables included in the appendix and to ensure that all appropriate tables are included in the appendix.

Tables RA-G3-1.3, “COPC Data Set – Carus Plant Groundwater (Total)”, and RA-G3-2.3, “COPC Data Set – Slag Pile Groundwater (Total)”, will be added to the Table of Contents for Appendix RA-G3, and Table RA-G3-4 will be removed.

2. Some results are listed as “Not Reported (NR),” assigned a surrogate value equal to the maximum RL, and assigned a “U” qualifier. The table footnotes should be revised to include additional text to clarify what is meant by NR results (for example, the sample was not analyzed, the result was not reported because of a laboratory error or omission, etc.) and to explain the rationale for assigning a U-qualified surrogate value. Also, the tables should include footnotes that explain the difference between results listed as NR versus results listed as “—.”

The table footnotes will be updated accordingly to define and clarify the difference between “NR” and “--”. “Not Reported (NR)” indicates that a result was reported as non-detect, but a reporting limit (RL) was not given, whereas dashes (“--”) indicate that analysis was not conducted for the parameter. As a conservative estimate of the NR value, the maximum available RL was assigned as a surrogate value.

APPENDIX RA-G3 SPECIFIC COMMENT

1. **Table RA-G3-3.1.** This table presents the ProUCL output for the LVR sediment. It is unclear why some U-qualified results for metals and organics are reported as zero (rather than at a fixed RL or as NR, missing, etc.). The table should be revised as needed to clarify why some sediment results are reported as zero.

The U-qualified results reported as zero should be reported as “NR”. See also Response to Appendix RA-G3 General Comment No. 2.

APPENDIX RA-G4 SPECIFIC COMMENTS

1. **Figure RA-G4-1.** The figure should be revised to define the acronyms “ASO” and “CSO” in the footnotes.

The acronyms ASO (Abandoned Sewer Outfall) and CSO (Combined Sewer Overflow) will be defined in the figure.

2. **Table RA-G4-4.** This table discusses exposure information for the mink and belted kingfisher. The equation used to determine the mink food ingestion rate is the equation for all mammals rather than the specific equation for carnivorous mammals. Because the mink was selected as the representative species for mammalian carnivores, the specific carnivore equation should be used in the calculations. Also, the equation used to determine the belted kingfisher food ingestion rate is the equation for all birds rather than the specific equation for avian carnivores. Because the belted kingfisher was selected as the representative species for avian carnivores, the specific carnivore equation should be used in the calculations. In addition, all text, tables, and figures should be revised as needed to discuss the correct equation results.

Both equations used to determine the mink and belted kingfisher ingestion rates were dry-weight equations instead of wet-weight equations. The information in the “Wildlife Exposure Factors Handbook” (EPA 1993) is all wet-weight information. The text and tables of the RI report do not contain conversions from dry weight to wet weight. If the conversions were conducted, conversion equations should be included and discussed. If the conversions were not conducted, wet-weight ingestion rate equations should be used. In addition, all text, tables, and figures should be revised as needed to discuss the wet-weight equation results.

Finally, the mink daily water ingestion rate could not be calculated using the ingestion rate value listed in the notes. Also, the value in the notes does not equal the mean of ingestion rate values reported for mink (non-farm raised) in the “Wildlife Exposure Factors Handbook” (EPA 1993). Either the daily water ingestion rate should be recalculated using the value listed in the notes, or the mean ingestion rate from the “Wildlife Exposure Factors Handbook” should be reevaluated and possibly recalculated. In addition, all text, tables, and figures should be revised as needed to discuss the correct ingestion rate values.

The BERA food chain models will be revised to use the carnivore-specific equations to determine food ingestion rates for the mink (carnivorous mammal) and belted kingfisher (carnivorous avian). The BERA text, tables, and figures will be revised accordingly. Note: this change is expected to

slightly decrease the risk to mink and slightly increase the risks to belted kingfisher; however, modifications to the models have little appreciable impact on the risk results.

At OU1, the equations utilized to estimate ingestion rates were obtained from Nagy (2001) and are in units of Dry Matter Intake (DMI) per day. Likewise, the sediment and tissue results utilized in the food intake equations are also presented in dry weight; fish tissue samples were freeze dried and reported in units of dry weight by the laboratory. Therefore, no dry weight to weight wet conversions are necessary, and no revisions to the risk assessment are proposed in response to this comment.

The surface water ingestion rate in the footnote should be 0.10 g/g_{bw}-day, not 0.079 g/g_{bw}-day. Note: the intended value (mean ingestion rate reported for non-farm-raised mink) was utilized in the risk characterization. The footnote will be revised accordingly.

3. **Table RA-G4-5.1.** This table lists the mammalian toxicity reference values (TRV). The copper no-observed adverse effect level (NOAEL) TRV listed is 25 mg/kg of body weight per day (bw/day), but the correct value is 5.60 mg/kg bw/day. This table and all tables that present the copper TRV should be revised as needed to present this correct value.

The copper NOAEL TRV for mammals will be corrected. Note: this will increase the risks to mink; however, copper is not a risk-driver and correcting the NOAEL TRV has little appreciable impact on the risk results – the NOAEL HQ will remain below 1.

4. **Table RA-G4-5.2.** This table lists the avian TRVs. The copper NOAEL TRV listed is 18.5 mg/kg bw/day, but the correct value is 4.05 mg/kg bw/day. This table and all tables that present the copper TRV should be revised as needed to present this correct value.

The copper NOAEL TRV for avians will be corrected. Note: this will increase the risks to belted kingfisher; however, copper is not a risk-driver and correcting the NOAEL TRV has little appreciable impact on the risk results – the NOAEL HQ will remain below 1.

APPENDIX RA-G5 SPECIFIC COMMENT

1. **Table RA-G5-2.1.** This table presents the Johnson and Ettinger inputs and assumptions for the resident. The indoor air exchange rate (ER) value used is 0.5 liter per hour (L/hr). No documentation is presented for this value. The EPA guidance “OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)” (EPA530-D-02-004) and EPA’s Advanced Groundwater (GW-ADV) Model for Vapor

Intrusion into Buildings, Version 3.1, both recommend an ER value of 0.25 L/hr for the residential scenario. The table should be revised to present an ER value of 0.25 L/hr, and all Johnson and Ettinger calculations should then be rerun using the new value.

The ER value will be revised as requested. The affected HHRA text and tables will also be revised accordingly. Note: evaluation of the residential scenario at OU1 was hypothetical and not considered a reasonably anticipated future land use scenario.

APPENDIX RA-E-G2 SPECIFIC COMMENTS

1. **Section 2.3.1, Page 9, Paragraph 2.** This paragraph describes the IBI process and refers to Illinois Department of Natural Resources (IDNR)-established reference reaches to determine if the reaches attain a specific level to support aquatic life. The text should indicate if the threshold values are specific to the watershed containing the LVR or if the values are state-wide values. In addition, if the values are watershed- or region-specific, the text should be revised to discuss the region containing the LVR.

The IDNR threshold values are within-state, region-specific values. The text will be revised as requested to clarify this fact.

2. **Section 3.1.1, Page 17, Paragraphs 2 and 3.** These paragraphs describe the physical habitat conditions at CAR002 and CAR003. For both locations, the text states that the reach was determined to be near full recovery from past channel modifications and considered stable. It is not clear how this determination was made when the reach associated with CAR001 was considered to be in a recovery stage. The text should be revised to provide the rationale for conclusions regarding the recovery of the LVR at CAR002 and CAR003.

“Recovered” streams have recovered most of their natural channel characteristics. “Recovering” streams were channelized in the past but still have poor channel characteristics. CAR001 was considered “recovering” and exhibited areas, particularly in portions of the middle of the reach, with channel characteristics suitable for healthy fish communities such as stable riffle/pool complexes with side-channel bars. These channel characteristics create diverse habitat niches within varied velocity/depth regimes (slow-deep, slow-shallow, fast-deep, fast-shallow). However CAR001 also exhibited areas, particularly the upstream and downstream limits of the reach, with channel characteristics less desirable for fish communities, such as homogenous velocity/depth regimes (slow-deep at the upper limit of the reach and fast-deep at the downstream limit of the reach). Some areas

within the middle portion of CAR001 were over-wide with little to no riparian vegetation cover to help cool the water and portions of the reach were too shallow for fish habitat. The downstream portion of the reach at CAR001 may be influenced by past channelization associated with the Illinois 6 Bridge crossing located approximately 350-feet downstream of the reach.

CAR002 was considered intermediate between “recovered” and “recovering” and CAR003 was considered “recovered”. Because CAR002 and CAR003 are located along the slag pile, these reaches have been more heavily physically influenced by industrial activities relative to CAR001. These reaches have been confined to a relatively narrow valley and therefore developed a particular stream type characterized by steep slope, low channel sinuosity, and a relatively narrow channel. The presence of large boulders, armored banks (slag), and a particularly coarse substrate provided channel stability. Stable riffle-pool complexes have formed and a variety of velocity/depth regimes were present creating diverse habitat more desirable for fish communities.

The risk assessment text will be revised accordingly.

3. **Section 3.3.6, Page 28, CAR001.** The second sentence in the paragraph states that the range of scores expressed within the IEPA Integrity Class for “Good” is 52.7 to 72.9. The range is actually from 41.8 to 72.9. The text should be revised to present the correct range.

The text will be revised as requested.

4. **Tables 3-19 through 3-27.** The macroinvertebrate IBI (mIBI) ranges listed in the tables do not match the ranges provided in the referenced documentation. The ranges should be adjusted to match the ranges in the referenced literature. In addition, all text, tables, and figures should be revised as needed to discuss the correct ranges.

The text will be revised as requested.

APPENDIX RA-S SPECIFIC COMMENTS

1. **TABLE RA-S2-5A, Notes f.** Using the Equation $PRG = (TR \times AT) / (ET \times ED \times EF \times AIF \times IUR)$ for asbestos exposure does not take into account a time weighted average based upon 24 hours per day. Either the above equation should be modified to reflect a time weighted average per day or the equations which detail the derivation of asbestos action levels in the Framework for Investigating Asbestos-Contaminated Superfund Sites - EPA-2008 (hereby known as the Framework) be used instead. These equations are described below.

Action Level for Asbestos in Air (f/cc) = Target Risk/(IUR_{LTL} • TWF)

Where;

Target risk = 1×10^{-4}

IUR_{LTL} = (From Table 2. of the Framework)

TWF = Time Weighting Factor

TWF = (Hours Exposed per day / 24 hours per day) x (Exposure frequency (days/year) / 365 days per year).

Tables RA-S2-5A and RA-S2-5B will be revised to present asbestos PRGs under RME and CTE conditions, respectively, using the suggested equations from the Framework. The HHRA report will be revised to present and evaluate risks associated with potential exposure to asbestos at OU2 using the revised receptor-specific asbestos PRGs.

EPA comments received 8-11-10

General Comments

1. Taking into account that the RI Report was written by two separate authoring entities, there should be a more consistent “feel” to the Final RI Report. For example, in Section 9, there are paragraphs discussing the OU1 conclusions, but then bullet points discussing the OU2 conclusions. There are also some areas where wording is confusing – where SulTRAC may refer to “primary contaminants of interest” and Geosyntec uses other terminology. A suggestion would be that a 3rd party reviewer be used to make certain the end product reads smoothly throughout.

A general review of the Report will be performed to identify potential edits that may contribute to a more consistent feel to the Final RI Report. It is recognized that the report was, in fact, written by two different consultants and multiple individuals and that any report of this magnitude would require multiple authors so that some differences in style will persist.

2. It should be made very clear in either the “Uncertainties Section” or somewhere else in the document what the current data gaps are that will need to be addressed at some point in the future at the Site. A list should be detailed to indicate what additional areas/contaminants should be further investigated so that these issues are not forgotten later in the FS or RD/RA.
 - a. Arsenic in residential area
 - b. Area east of LVR and associated contaminants
 - c. Area north of OU2 (Muddies)
 - d. Any other data gap areas or areas that may need to be investigated further

The following text will be added to Section 9.5.2, Data Limitations and Uncertainties: “Additional future sampling at and around OU2 may be necessary. Additional sampling would take place during the future Feasibility Study, Remedial Design, and Remedial Action project phases.”

3. The maps that depict “Extent of Contamination” for a specific contaminant are extremely useful and if possible should be used for OU1 as well. It would be helpful if more detailed maps of the LVR are provided so that greater detail can be seen on the map(s). Also, on the Geosyntec maps, if it is possible to highlight any individual contaminant that exceeds a screening level, that would be useful – such as for individual contaminants listed on the SVOC maps.

The comment is acknowledged. The extent of contamination within OU1 consists of the entire Slag Pile Area, or isolated locations within the Plant Area. Further, the soil contamination is the result of the historic placement of slag and sinter, rather than a release the extent of which is based on the subsequent migration. As such a map depicting the extent of contamination is of somewhat limited use in characterizing the presence or absence of contamination. The sampling locations and analytical results for the LVR will be revised in certain of the figures to improve the legibility of those figures. Revisions to certain figures to remove non-detected contaminants will hopefully improve the ability to identify where contaminants exceed their respective screening levels.

Specific Comments

1. Section 4, page 4-2. Remove extra bullet.

This typographic error will be corrected.

2. Section 4, page 4-35. Under the PCBs heading, the “T” in table is bolded.

This typographic error will be corrected.

Appendix RA Draft Risk Assessment

1. **1.2.4 Potential Fate and Transport Processes, p. 1-18.** If “the contribution of Site groundwater to the overall flow of the LVR has not been determined”, then what is the basis for speculating that it “may be inconsequential”?

The phrase “and may be inconsequential” will be deleted as requested. See also Response to Appendix RA Section 1.0, Specific Comment No. 2.

2. **1.2.5.2 OU2 Risk Assessment Exposure Areas.** Only the last 2 of the 7 OU2 exposure areas are labeled in Fig. RA-1-2.

The figure will be revised to include labels for all seven OU2 exposure areas.

3. **3.1.1.1.2 Slag Pile.** Pioneering vegetation (not understory) includes bladder-campion (*Silene vulgaris*) and an unidentified sedge (*Carex* spp.). It should be noted that “the seeds of sedges ... are eaten by many kinds of wildlife” including songbirds (especially sparrows), upland gamebirds (grouse), rails, ducks, and chipmunks; and foliage is browsed by deer (Martin, et al. 1951). In other words, sedges provide an exposure pathway to wildlife at an early stage of vegetative establishment on the slag pile.

Martin, A., H. Zim and A. Nelson. 1951. American Wildlife & Plants, A Guide to Wildlife Food Habits. reprinted 1961. Dover Publ., New York. 500 p.

Field sparrows (*Spizella pusilla*) also inhabit the site, and feed on a mix of seeds and invertebrates.

The comment is acknowledged. Plants will be included in the SLERA CSM, and the presence of vegetation on the Slag Pile is already acknowledged in the conclusions of the SLERA. Therefore, no changes are proposed in response to this comment.

4. **3.1.1.1.3 Little Vermilion River.** LVR is repeatedly characterized as “the most ecologically relevant habitat associated with the Site”. The meaning of this characterization is unclear. How is aquatic habitat more relevant than terrestrial habitat?

This comment is acknowledged. The phraseology was intended to convey that, relative to the highly disturbed habitat of the Carus Plant and highly disturbed/disturbed with vegetation habitat of the Slag Pile, the LVR represents the highest quality habitat at OU1. The phrase “ecologically relevant” will be replaced with “ecologically valuable” in the revised risk assessment.

5. **3.1.1.2 OU2 Ecological Habitat Characterization.** In soils too young or disturbed to show soil profile development, the presence of reducing soil conditions indicates the soil is hydric (U.S. ACE 1987 Part III 44.d). Unless reducing soil conditions have been shown not to be present, for example, a negative chemical test for the presence of ferrous iron, the hydric soil status of the depressions with hydrophytic vegetation is undetermined.

U.S. ACE. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1 (on-line edition). U.S. Army Corps of Engineers. Waterworks Experiment Station, Vicksburg. <http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf>

Hydric Soils Technical Note 8 http://soils.usda.gov/use/hydric/ntchs/tech_notes/note8.html

The discussion on the determination of the potential wetlands status will be revised to include additional detail, including further details on the status of the soils.

6. **3.1.2.1.1 OU1 Potentially Complete Exposure Pathways.** The analysis of dermal/inhalation versus oral exposure pathways in EPA (2005b) is not intended to exclude any consideration of dermal or inhalation pathways in BERAs as shown in the following statements (EPA 2005b): At sites with high VOC and/or certain PAH concentrations in soils with burrowing mammals present, the inhalation exposure pathway should be considered in the baseline ERA. In this case, the contaminants would not be excluded in the screening step.

Exclusion of dermal and inhalation exposure routes for the Eco-SSLs does not preclude their inclusion in the site-specific baseline ERA. If it is expected that receptors may be more exposed to contaminant(s) via dermal and/or inhalation exposures relative to oral exposures due to site-specific conditions, these exposure routes should be evaluated as part of the baseline ERA.

Exclusion of inhalation or dermal pathways should be justified on the basis of the likely uptake pathways for the contaminants at the site, not by a reference to EPA (2005b).

The text will be revised to include additional discussion regarding the inclusion/exclusion of specific exposure routes for quantitative evaluation in the BERA. Given that the primary

COPECs are metals, which are non-volatile, and that site-specific bioavailability of metals is generally low, the fraction of total uptake via the inhalation and dermal pathways is likely to be highly limited relative to uptake via the ingestion pathway. Therefore, no change is proposed to the BERA calculations in response to this comment; the BERA will only quantitatively evaluate the ingestion pathway for upper trophic-level receptors.

7. **3.3.1.2 Slag Pile SMDP.** Phytotoxicity is an ecologically adverse effect. The screening assessment indicates potential for phytotoxic effects, and the phytotoxicity tests are a BERA refinement that support, or do not contradict, the SLERA result.

The SLERA conclusions will be revised to indicate that the phytotoxicity tests support the SLERA results that several constituents in Slag Pile soils, primarily metals, have the potential to adversely affect ecological receptors.

8. **3.3.2.5 Areas East of the Little Vermilion River SMDP.** The screening assessment of limited soil data shows large exceedances of metals screening values. While not part of OU1 or OU2, the screening results do not justify no further evaluation of risk. Unless the contaminants are demonstrated to have come from a non-site source, this area is part of the site and further risk characterization will be required.

Supplemental Response: The need for and extent of further risk characterization of the areas east of the Little Vermilion River will be discussed with the regulators. Any additional sampling to support the expanded risk characterization of these areas is expected to be conducted as part of the pre-design process.

9. **3.4.1 OU1 SLERA Conclusions and Recommendations.** See comments on 3.3.1.2 (phytotoxicity is an adverse effect) and 3.1.1.1.2 (sedge provides an exposure pathway).

The SLERA Conclusions and Recommendations will be revised as appropriate based on the responses and comments presented herein. See also response to Comment No. 3 and 7 of the 11 August 2010 Comment Letter.

10. **4.1.2.2.2 Study Design for Evaluating AE3 and AE4.**

Receptor Exposure Assumptions. See comments on Table RA-G4-4. Mink area use factor is underestimated, and the sediment ingestion of the surrogate species for kingfisher is incorrectly reported.

Toxicity Reference Values. The approach for deriving LOAEL TRVs is inconsistent with the intent of the EcoSSL approach for deriving NOAEL TRVs. For the EcoSSLs, the NOAEL TRV is first calculated at the geometric mean of NOAELs from accepted studies. This is a conservative approach because it ensures that the NOAEL TRV will be *lower* than the highest NOAEL in the data base. In a second step, the geometric mean NOAEL will not be selected for the EcoSSL if it is higher than a bounded LOAEL in the toxicity data base (a bounded LOAEL is from a single study reporting both NOAEL and LOAEL values). In other words, if a bounded LOAEL is lower than the geometric mean NOAEL, EcoSSL discards the geometric mean NOAEL as insufficiently protective, and replaces it with a lower and more conservative value that does not exceed *any* bounded LOAEL from accepted studies.

The BERA approach of taking the geometric mean of LOAELs is non-conservative because it ensures that the LOAEL TRV will always be *higher* than the lowest LOAEL values. The geometric mean LOAEL approach is also non-conservative compared to the species sensitivity distribution (SSD) approach for deriving TRVs from synoptic toxicity data. Usually, TRVs based on SSDs are calculated to be protective of 95 % of species, which will always result in a lower value than the geometric mean of the same data set.

Aside from being inherently non-conservative, a secondary issue with this approach is the uncertainty of combining unbounded and bounded LOAELs in the calculation.

The geometric LOAEL TRVs should be replaced with either SSD-derived TRVs protective of 95 % of species, or with the lowest LOAEL from an appropriate study.

An additional point is that the EcoSSL study summaries are secondary literature, and, like all secondary literature, the data cannot be assumed to be 100 % accurate. The original studies for the TRVs that drive important remedial decisions at the site should be reviewed.

Subsequent discussions among some or all of USEPA, IEPA, SulTRAC and Geosyntec modified the nature of this comment and the proposed resolution. The proposed resolution is still under

consideration and a more detailed response to this comment will be submitted on or before September 3, 2010.

Supplemental Response: As to the Receptor Exposure Assumption portion of the comment, the sediment ingestion rate of 2% for the surrogate species (mallard duck) for the kingfisher was obtained from the Table 4-4 of the WEFH (USEPA, 1993), and the reference will be revised accordingly.

As to the mink area use factor (AUF) portion of the comment, the likely size of the mink home range relative to the riparian corridor along the LVR was discussed between Geosyntec and EPA. EPA's position is that an AUF of 1 should be used to compute risk associated with the mink at the Site. In our view, this position is not consistent with the scientific literature or the characteristics of this Site. The riparian corridor along the LVR offers marginal mink habitat (Loukmas and Halbrook, Wildlife Society Bulletin v29, pp821-6). No mink sightings or signs of mink foraging have been observed at the site. Mink population density is inversely related to the quality of the habitat. Several of the mink population density and home range studies cited in the Wildlife Exposure Factors Handbook (WEFH; USEPA, 1993) are conducted in areas with abundant food sources and higher quality mink habitat (coastal estuarine systems). This may bias those studies high relative to our site conditions. In the Arnold and Fritzell (1987) paper the study area offers a more limited selection of aquatic prey and therefore the mink show a greater foraging range. We believe this paper, cited in the WEFH, provides the best representation of the mink home range relative to the LVR. Thus, the AUF used in the Draft HHRA (0.4) had a strong scientific foundation given the characteristics of the LVR and this Site and is believed to be appropriate. We have reluctantly agreed to recalculate the mink risks using an AUF of 1 for the final risk assessment, and will present information on the impact of this assumption in the uncertainty section.

As to the Toxicity Reference Value portion of the comment, subsequent discussions among the ecological risk assessment representatives of the stakeholders resulted in an agreement to use the Region 9 BTAG high TRVs as the LOAEL TRVs in the final BERA.

While agreement has been reached, we disagree that the methodology explained and approved in the Consensus Document is inconsistent with the EcoSSL approach or is not conservative. These statements in the comment and the alternative calculation methods suggested imply that the lowest LOAEL results reported in the EcoSSL study have greater validity than higher results.

Given that all the individual study results included in the EcoSSL tables were identified by EPA (after a multi-stakeholder review process) as appropriate for deriving wildlife TRVs, we have no basis to give greater weight to the lowest LOAEL results reported in EcoSSL tables. Toxicity studies based on different species, dosing routes, chemical forms, and test conditions can be extremely variable. No one result in an array of such data is inherently more reliable than another. EPA compiled the EcoSSL documents so that ecological risk decisions could be made on a broad array of available data rather than on single points that are inherently subject to variability and study error. Deriving LOAEL TRVs based on a single study or a judgmentally selected group of studies suffers from the deficiency that it discards data that EPA has deemed reliable. In addition, use of the geometric mean of the EcoSSL LOAEL values has been used to derive LOAEL TRVs at other sites. See e.g. Final Screening-Level Ecological Risk Assessment Work Plan for Phase IV Remedial Investigation/Feasibility Study at the Former Lake Ontario Ordnance Works, Addendum to the Screening-Level Ecological Risk Assessment at Selected Exposure Units, June 2009, Table 3.1 and notes on p. 24, available at <http://www.lrb.usace.army.mil/derpfuds/loow/loow-phase4ri-slerawp-redacted-2009-06.pdf>). For these reasons, we believe use of the geometric mean is a preferable and appropriately conservative approach for calculating the LOAEL TRVs. Since use of the Region 9 BTAG High TRV values as the LOAEL TRVs for this Site has been accepted, we have included this paragraph simply to respond to the comment.

11. **4.1.5.2 AE2 – Function and Viability of the Fish Community.** Fish abundance is depressed in sample reaches near the site. Based on catch per unit effort (CPUE), Reaches CAR002 and CAR003 have only about one-third of the abundance of fish in Reference Reach CAR004. The pronounced reduction in fish abundance is a line of evidence of ecological impairment near the site.

Abundance is just one measure of the fish community structure that; taken in isolation can be misleading with regard to community impairments. Fish distribution can be clustered (e.g., a school of minnows), and a random hit or miss of one of these schools when sampling can have a great influence on measured abundance. In the case of the LVR assessment, the number of individuals varied from 172 at the upstream (in-stream) reference location (CAR004) to 61 at the location (CAR003) on the upstream edge of the slag pile, to 53 at the next location downstream along the slag pile (CAR002) and 107 at the most downstream location, also along the slag pile (CAR001). The greater measured abundance of just two species, Northern hog sucker and

bluntnose minnow, are largely responsible for the greater measured abundance at the reference location (CAR004) compared to the slag pile/CSO site (CAR003) and slag pile sites (CAR002 & CAR001). In the case of bluntnose minnow, only two individuals were collected at the three downstream stations, while 52 specimens were collected at CAR004, and these were collected as a school. Electrofishing sampling efficiency was greater at CAR004 because the reach was more wadeable than the other reaches. The downstream reaches had more areas with deeper, faster flowing conditions, which negatively impacted sampling efficiency. There was also more aquatic vegetation associated with CAR004, which creates quiescent areas attractive to bluntnose minnow.

Because measures of abundance can be affected by sample collection techniques, associated sampling efficiency, habitat influences, and fish behavioral and distribution patterns, fish abundance alone is not a sensitive measure of impairment or enhancement of the fish community.

As an example of how fish abundance alone provides an incomplete picture of community status, consider species diversity. Certainly there is consensus that greater species diversity is a positive fish community attribute. Diversity indices provide more information about community composition and take the relative abundances of different species into account as well as species richness (i.e., number of individual species). The Shannon-Wiener¹ diversity index (H') is an index that is commonly used to characterize species diversity in a community accounting for both abundance and evenness of the species present (how equal the community is numerically). The index is increased either by having additional unique species or by having greater species evenness. Calculated Shannon-Wiener diversity indices (H') for each LVR sampling location are 2.18 (CAR004), 2.31 (CAR003), 2.24 (CAR002), and 2.08 (CAR001). Thus, when considering measured fish abundance and the evenness of the species present, there is little difference in species diversity among the sampled reaches. However, note that the slag pile/CSO reach, CAR003, and slag pile reach, CAR002, have greater species diversity than the reference reach, CAR004. But again, though the Shannon-Wiener index incorporates two attributes of the fish community (abundance and species evenness), this single index alone is still not a fully reliable measure of fish community impairment.

The fact that single measures of the fish community are unreliable in determining impairment status is the founding basis for development of the multi-metric assessment approach upon which

¹ Levinton, J.S. 1982. Marine Ecology. Prentice-Hall, Inc. Englewood Cliffs, NJ. 526 pp.

Indices of Biological Integrity (IBIs) are based. In the case of the IDNR IBI protocols, which (as for most states) were developed using EPA protocols, fish abundance is not included as one the 10 metrics used to objectively and defensibly assess fish community impairment status in support of Clean Water Act goals (i.e., Section 303(d)). Based on assessment of LVR fish and macroinvertebrate communities using established IBI protocols, the reach of river along the slag pile is fully supporting designated aquatic life uses in accordance with Clean Water Act goals. This finding presents the more compelling line of evidence with regard to ecological impairment near the site.

No revision to the report text is anticipated.

12. 4.1.7 OU1 BERA Summary and Conclusions. See comment on 4.1.5.2.

Conclusions related to food chain modeling may be revised (see comments on 4.1.2.2.2 and Table RA-G4-4).

The BERA Summary and Conclusions will be revised as appropriate based on the comments and responses presented herein.

13. Table RA-G4-4 Exposure Parameters Used in the Food Chain Model OU1. Mink (6) Home

Range: Since the purpose of the mink food chain model is to evaluate aquatic-based exposures, mink range in river length is a more appropriate metric for calculating the area use factor (AUF). The mean 1.85 km length for adult female mink (Gerell 1970) is recommended. Note that the citation for this paper is incorrect in U.S. EPA (1973). The correct citation is:

Gerell, R. 1970. Home ranges and movements of the mink in southern Sweden. *Oikos* 21: 160-173.

Mink (7) Area Use Factor: 1.0 calculated with the equation for Belted Kingfisher (7)

Belted Kingfisher (4) Incidental Sediment Ingestion Rate: Beyer, et al. (1994) report 3.3 % sediment in diet by dry weight for mallard, not 2 %.

The mink area use factor is supported by data from the Wildlife Exposure Factors Handbook (WEFH; USEPA, 1993). This comment has been the subject of discussions between USEPA and Geosyntec. The comment is still under consideration and a further response will be provided on or before September 3, 2010.

The sediment ingestion rate of 2% for the surrogate species (mallard duck) for the kingfisher was obtained from the Table 4-4 of the WEFH (USEPA, 1993); the reference will be revised accordingly.

Supplemental Response: Regarding the mink area use factor, see the response to Appendix RA Draft Risk Assessment, Comment 10 on 4.1.2.2.2 Study Design for Evaluating AE3 and AE4 of A.

- 14. 4.2.2.2.3 Soil Toxicity Studies.** This activity is better described as part of the BERA.

This comment is still under consideration and discussion by Geosyntec and SulTRAC. A further response will be provided on or before September 3, 2010.

Supplemental Response: For OU1, soil toxicity tests were conducted as a component of the SLERA per the request of EPA since there was no BERA of terrestrial areas for OU1. Therefore, these discussions are presented within the SLERA for OU1. For OU2, these results will be discussed in the BERA.

- 15. 4.2.3.2 Toxicity Reference Value.** See comment on 4.1.2.2.2 Toxicity Reference Values

The text will be revised to describe the selection of TRVs based on the response to Comment No. 10 of the 11 August 2010 Comment Letter.

- 16. Appendix RA-E-S3 OU2 ERA Tables.** Soil ingestion rates should be calculated as a fraction of dry-weight food ingestion, not wet-weight food ingestion. The soil-based exposures are overestimated.

Total food ingestion should not be adjusted to account for the soil ingestion component, that is, the total food components should sum to 100 %, and the soil ingestion component added above and beyond. The reason is because the Nagy (2001) regressions for food ingestion are calculated from regressions for field metabolic rate (Nagy, et al. 1999). FMRs are based on the energetics of free-ranging animals, which are converted to food ingestion rates by dividing by the metabolisable energy content of the diet. The food ingestion rates generated by this method are the amounts of food required to provide for the energy used by the field metabolic rate. The calculation does not include extraneous components of the diet, such as soil or sediment, that do

not contribute calories. The food-based exposures are underestimated by inappropriately forcing the combined dietary and soil components to sum to 100 %.

Nagy, K., I. Girard, and T. Brown. 1999. Energetics of free-ranging mammals, reptiles, and birds. *Ann Rev Nutr* 19: 247-77.

Soil ingestion rates in the draft RA-E-S3 OU2 ERA tables were calculated as a fraction of dry-weight food ingestion rather than wet-weight food ingestion.

Total food ingestion was not adjusted to account for the soil ingestion component in the draft risk assessment. The soil ingestion component was added above and beyond the total food component of 100 percent.